Chapter II
Alternatives

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Chapter II presents the Forest Plan alternatives. It provides the reader with an opportunity to determine which alternative maximizes total, long-term net public benefits.

More specifically, this chapter includes the following:

- An overview of the process used in developing the alternatives.
- Identification of the alternatives eliminated from detailed study.
- Descriptions of the alternatives considered in detail.
- Comparisons of the alternatives' response to management problems, benefits and economic values produced, and environmental consequences.

Major Changes to Chapter II

Comments received on the Draft EIS during the public review period provided the basis for changes to the preferred alternative, Alternative 7. The significant results and benefits associated with Alternative 7 (Table 2.9) were revised to reflect these changes. In addition, discussions and tables in the Comparison of Alternatives section were revised.

The Differences in Economic Benefits and Cash Flows section was expanded and rewritten to better explain the economic values used in comparing alternatives. Also, the economic interrelationships of achieving multiple resource objectives is discussed.

The national, regional, and local overview on resource demands in the Major Tradeoffs Among Alternatives section was expanded. In addition, the comparisons of alternatives, including Table 2.15, Indicators of Responsiveness of Alternatives to Major Issues and National Concerns, was revised to reflect the changes to Alternative 7.

These changes and all those made throughout this document are due to the review of the draft documents by both the public and the Forest Service. The changes that are found in the Final Environmental Impact Statement are the result of attempts to make this document as responsive to the public as possible.

The planning period being considered for the Final EIS is 10 to 15 years. Throughout this document, projections beyond 10 to 15 years are listed for the purpose of showing effects. The decades beyond the first decade represent the projected situation if the alternatives were fully implemented for that time period.

In some instances, figures are presented as an average annual amount over the first two decades combined. In these cases, figures for individual decades are displayed in the Appendix Volume, Appendix B, Part 8.

Net Public Benefit

- The purpose of Forest planning is to ensure that goods and services are provided in an environmentally sound manner so that the public receives the maximum net benefit. Net public benefit is defined as the difference in value between all outputs and positive effects (benefits) and the associated inputs and negative effects (costs) for producing those benefits. Not all benefits and costs have dollar values, but they still must be considered when determining which Forest Plan alternative provides the highest net public benefit.

Benefits

Providing benefits from the National Forests is a primary goal of multiple-use, sustained yield management. The "benefits" portion of the net public benefit definition includes outputs and positive effects. (Effects are discussed later as a separate component of net public benefit.) A major part of determining "benefits" is deciding which outputs have dollar values. This has a significant bearing on the cost-efficiency analysis which is discussed later. Detailed descriptions of benefits are included in the Final EIS Appendix Volume, Appendix B, Part 4 - Economic Efficiency Parameters.

The following categories of benefits were used in Forest planning:

Priced - Benefits that are or could be sold in the market place.

- Market. Outputs that are routinely traded in an established market and return dollars to the U.S. Treasury. These outputs are timber, camping at developed campgrounds, and federally owned minerals.

- Nonmarket. Outputs that are not customarily sold in an established local market and, therefore, do not return dollars to the U.S. Treasury, but to which a dollar value can be assigned. This value represents what a user would be willing to pay. Examples include hunting, fishing, dispersed recreation, and wilderness use.

Nonpriced - Benefits that do not have available market transaction evidence. There is no reasonable basis for making market value estimates that are comparable to priced output values. Examples are improved habitat for threatened and endangered species, increased vegetative diversity, and increased jobs and income in local economies.

Costs

The direct costs of providing a set of benefits are relatively easy to define. These are the budget expenditures necessary to carry out management activities on the Forest. Detailed descriptions of the costs are included in the Final EIS Appendix Volume, Appendix B, Part 4 - Economic Efficiency Parameters.

Effects

The definition of net public benefit includes reference to positive and negative effects. Effects are combined into one category for purposes of analysis and comparison in this EIS. Some effects can be measured by use of numbers, but others can only be described in words. For example, the number of acres of a kind of wildlife habitat can be measured, but its overall condition can only be described.

Forest planning objectively analyzes and displays alternatives for addressing the management problems. What one person sees as a "positive" effect may be considered a "negative" effect by someone else. Also, the terms positive and negative imply "good" and "bad", which is a matter of personal judgment in many cases.

Therefore, effects are lumped in the rest of this EIS. The effects of the various alternatives are presented, but interpretation of these effects as positive or negative is left for the reader to define.

The analysis of alternatives requires a clear assessment of both positive and negative effects of planned actions. Tradeoffs between these effects were analyzed to allow evaluation of the response of each alternative to the resolution of Forest problems. From this base, necessary mitigation actions could be proposed that allow achieving the objectives of each alternative while minimizing undesired effects.

Arriving at Net Public Benefit

Determination of net public benefit cannot be reduced to a single index. All of the information on benefits, costs, and effects must be combined. Therefore, the decision on which alternative maximizes net public benefit is a subjective determination.

The decision on which alternative provides the greatest net public benefit uses information about economic efficiency, resource tradeoffs, nonpriced benefits, and public preference. Public preference is expressed through the issues and concerns presented in the statements of the management problems. Resource tradeoffs are measured through the level of outputs produced by the alternatives, while nonpriced benefits are measured through a number of indicators.

Role of Economics in Forest Planning

Although net public benefit is composed of several parts, economics plays an important role in Forest planning. A major concern, not only to the Forest Service, but also to the taxpayers, is that the National Forests be managed efficiently. This concern is addressed through the use of economic efficiency criteria in addition to other criteria in developing alternatives and selecting a preferred alternative.

NFMA requires that each alternative will present to the extent practicable the most cost-efficient combination of management practices examined that can meet the objectives established in the alternative.

Present Net Value

Economic efficiency is measured through the use of present net value.

Present net value (PNV) is the difference in dollars between anticipated valued benefits and anticipated costs. A large PNV indicates that taxpayers, as owners of the National Forest, could realize a large net return from their investments. A smaller PNV indicates a smaller net return. Since these benefits and costs are realized in the future, their value must be discounted back to the present. For a detailed discussion on the economics of the planning process, see the Final EIS Appendix Volume, Appendix B, Part 4-Economic Efficiency Parameters.

Maximum PNV for an alternative does not necessarily represent the maximum net public benefit. Net public benefit also includes benefits and cost without a dollar value.

Analysis of Economic Efficiency

Each alternative developed for the Ottawa National Forest has a different set of goals and objectives in response to the management problems. Each alternative consists of the most economically efficient set of prescriptions needed to meet these goals and objectives. Lower PNV in alternatives represents the economic cost of producing nonpriced benefits and addressing issues and concerns. For example, because dollar cost of aspen management frequently exceeds dollar benefits, increasing the acreage of aspen management within an alternative may drive PNV down. But, in contrast, the improvement to white-tailed deer habitat, a nonpriced benefit, may increase significantly. So, expanding aspen acreage may decrease PNV while raising net public benefits if the overall benefits are judged to exceed the costs. The decision as to whether the values of these nonpriced benefits are worth their costs is based on the reader's judgment.

Additional information on the development of prescriptions and their role in the analysis can be found in the Final EIS Appendix Volume, Appendix B, Part 3 - The Forest Planning Model, Development of Prescriptions.

A linear programming model (FORPLAN) was used to help select the most economically efficient set of prescriptions to meet the goals and objectives of each benchmark and alternative. This was accomplished by selecting prescriptions within each alternative that in combination have the highest net economic priced benefits. This was done while still meeting the other objectives of the benchmark or alternative. (See Final EIS Appendix Volume, Appendix B, Part 3 - The Forest Planning Model.)

Alternative Development Process

The requirements of alternative formulation (36 CFR 219.12(e) and (f)) are that a broad range of reasonable alternatives shall be developed. The range must comply with National Environmental Policy Act requirements. A broad range also provides a basis for identifying the alternative that comes closest to maximizing net public benefit.

Developing the range of alternatives included activities such as identifying public issues and concerns, assembling resource information and data, using interdisciplinary team input, applying analytical techniques, and using professional judgment to interpret the results. Figure 2.1 displays some of the major tasks necessary to identify, analyze, and describe the range of alternatives discussed in this chapter. Additional detail of the analysis process is in the Final EIS Appendix Volume, Appendix B.

Benchmarks were used to define the maximum and minimum limits within which outputs and/or conditions can be provided. These limits take into account land capability, projected resource demands, and economic efficiency, although not all benchmarks were limited by these features. Alternatives that respond differently to each of the four management problems and provide varying amounts of benefits were developed within the limits set by benchmarks.

A broad range of alternatives was developed. The range of alternatives was defined by the range of responses necessary to address the major public issues, management concerns, and resource opportunities identified during the Forest planning process, and described in the four problem statements. A fifth problem, landownership, was dropped from further consideration. See Chapter I, Final EIS.

Each problem statement contains several facets. In some cases, similar concerns are expressed in more than one problem statement or the concerns are interrelated.

Alternatives were defined in terms of goals and objectives that would respond in some manner to the management problems. It was also important that the set of goals for an alternative be stated in the same terms as the set of goals for any other alternative.

Comments received on the Draft EIS during the public review period provided the basis for additional adjustments to the preferred alternative. A description of the alternatives and the changes made is found in the section titled "Alternatives Considered in Details" which begins on page II-25 of this chapter.

Figure 2.1
Steps Taken in Alternative Development

1. Identify Public Benefits

   - Analyze issues and concerns.
   - Identify public preferences.
   - Define specific management problems.
   - Define outputs or conditions necessary to address problems.

2. Determine Ability to Supply Benefits

   - Determine land and resource capability to supply outputs or conditions.
   - Develop management prescriptions, including standards and guidelines to mitigate negative environmental effects.
   - Estimate future demands for benefits.

3. Determine Range of Benefits and Costs

   - Determine minimum and maximum output and/or condition amounts and their costs from benchmarks.
   - Place limits on minimum and maximum of outputs in order to avoid providing too much or too little of any benefit.

4. Determine Need for Change

   - Determine current ability to meet demand.
   - Identify opportunities to address management problems.

5. Formulate Range of Alternatives

   - Develop alternatives considered in detail to reflect range of responses to problems.
   - Eliminate alternatives that are not biologically, physically, or legally feasible.
   - Select management areas and schedule management practices for each alternative.
   - Identify environmental consequences and develop additional standards and guidelines to mitigate adverse effects.

Themes for Defining the Goals of Alternatives

Eight themes for goals were developed to provide a common basis for defining alternatives. The goal themes also served to ensure an appropriate range of responses to the four problems, with specific attention to the critical facets of the problems.

Each alternative was defined in terms of a unique combination of eight goal statements. Each goal within an alternative was stated in terms of the theme for that respective goal. For example, Goal 6 in each alternative was stated in terms of how much area would be recommended for wilderness or wilderness study, be it a lot or a little, and which areas would be included.

Among the range of alternatives, a range of response to the critical facets of the problems was represented in terms of the eight goals. See Table 2.1 and the discussion that follows.

Each alternative responded to some degree to the resolution of the management problems. Any given alternative may respond in a very positive manner to some problems and not so well to other problems.

Table 2.1
Relationship Between the Problem Statements, Goals, and Key Measurements of the Goals

Problem Statement	Critical Facets of Problem	Goal Themes That Address Critical Facet of Problem	Key Measurements of Goal Theme
Problem 1- Transportation	Seasonal access provided by transportation system	Goal 5 Theme	Miles of local road construction by road standard.
	Variety of recreation settings	Goal 5 Theme	Mix of ROS classes.
	Economic Efficiency	Goal 7 Theme	Present net value.
Problem 2- Wildlife	Aspen and conifer cover	Goal 1 Theme	Managed aspen acres. Thermal cover acreage.

Table 2.1 (continued)

Problem Statement	Critical Facets of Problem	Goal Themes That Address Critical Facet of Problem	Key Measurements of Goal Theme
	Diversity	Goal 1 Theme Goal 2 Theme	Aspen acres. Conifer acres. EAM hardwood acres. UAM hardwood acres.
	Clearcutting	Goal 8 Theme	Acres of temp. opening.
	Spatial distribution of activities	Goal 3 Theme	Management activities within medium and high wildlife opportunity areas.
	Economic efficiency	Goal 7 Theme	Present net value.
Problem 3- Landownership	N/A (Refer to Chapter I,	N/A Final EIS for	N/A resolution)
Problem 4- Vegetation Management	Clearcutting	Goal 8 Theme	Acres of temp. opening.
	Chemical use	Goal 4 Theme	Acres of artificial reforestation. Acres of conifer release. Acres of conversion to pine.
	Species/product mix and amount	Goal 1 Theme Goal 2 Theme	Timber production by species/ product group (short- and long-term).
	Economic efficiency	Goal 7 Theme	Present net value.
Problem 5- Wilderness	Wilderness designation or study or recommendations	Goal 6 Theme	Amount and location of recommended wilderness or wilderness study areas.

The theme for each of the eight goals and the role each goal theme plays in addressing the management problems is described below.

Goal Theme 1

Provide for a diverse range of vegetative composition through management of aspen, short-rotation conifers, long-rotation conifers, and hardwoods to provide a variety of recreation opportunities, visual variety, timber products, and wildlife habitats.

Among the range of alternatives, the role of Goal 1 in addressing problems is to:

- Address deer/grouse issue through management emphasizing aspen and cover.
- Provide for vegetative diversity, insect and disease control, wildlife diversity.
- Provide for long-term production of a mix of species/products.
- Help meet minimum legal requirements for viable populations.
- Help meet visual quality objectives.
- Provide an opportunity to match tree species to land capabilities and management direction.

Goal Theme 2

Manage northern hardwoods to create a mixture of vegetative communities (species, size structure, age class) that produce a variety of recreation settings, visual variety, timber products and wildlife habitats over the planning horizon.

Among the range of alternatives, the role of Goal 2 in addressing problems is to:

- Utilize both even-aged and uneven-aged management systems to provide for increased vegetative diversity.
- Provide for even-aged management that will influence the acreage of temporary openings.
- Provide for uneven-aged management that will influence the visual quality and help maintain viable wildlife populations.
- Provide for even-aged regeneration harvest that will influence economic efficiency and increase short-term supply of hardwood products.
- Provide a short-term and long-term mix of hardwood sawtimber and pulpwood which is influenced by the mix of even-aged and uneven-aged management of northern hardwoods.
- Increase diversity of hardwood tree species which can be achieved through even-aged management.

Goal Theme 3

Distribute and schedule vegetative management practices to provide a steady flow of timber to markets and improve wildlife habitat where benefits are greatest.

Among the range of alternatives, the role of Goal 3 in addressing problems is to:
- Provide timber products closer to markets.
- Reduce total cost of providing timber and wildlife benefits through integration and provide opportunity to improve vegetative diversity.
- Provide for an opportunity to manage vegetation where benefits associated with deer and grouse are increased.

Goal Theme 4

Carry out reforestation activities with emphasis on natural regeneration and with prudent use of chemicals.

Among the range of alterntives, the role of Goal 4 in addressing problems is to:
- Reduce chemical use.
- Provide for cover type and species diversity.
- Reduce impacts on visual quality.
- Reduce possible health risk.

Goal Theme 5

Provide a local transportation system that provides a mix of road standards and density that is appropriate to manage for access for a variety of recreational opportunities, to provide for transportation of timber in an efficient manner, to provide a mix of ROS classes, and to provide threatened and endangered species habitat.

Among the range of alternatives, the role of Goal 5 in addressing problems is to:
- Utilize opportunity to match local road standards to land capability and intended use.
- Provide for an efficient transportation system.
- Provide for a variety of recreation opportunity settings.
- Provide habitat (minimum 256,000 acres) for species of wildlife requiring remoteness.

Goal Theme 6

Provide for wilderness designation and/or study.

Among the range of alternatives, the role of Goal 6 in addressing problems is to:
- Resolve Sturgeon Gorge congressionally designated wilderness study requirement.
- Resolve roadless area issue.

Goal Theme 7

Manage the Forest in an economically efficient manner.

Among the range of alternatives, the role of Goal 7 in addressing problems is to:
- Utilize opportunities to manage the Forest in an economically efficient manner.
- Utilize opportunities to provide desired levels of goods and services efficiently.

Goal Theme 8

Manage an appropriate amount of temporary openings (clearcuts) to achieve integrated resource management objectives.

Among the range of alternatives, the role of Goal 8 in addressing problems is to:
- Address public's concern about clearcutting.
- Provide for opportunities to manage vegetative types of intolerant and mid-tolerant species that require even-aged management practices.
- Provide for opportunities to provide dense young growth habitat for deer and grouse.

Full Range of Responses

Alternatives were defined that would represent a full range of response to the problems in terms of the eight goal statement themes.

The alternatives were formulated by identifying compatible sets of responses to the problems in terms of eight goals.

Trade-offs between alternatives are expressed in terms of how individual goals change from one alternative to another. For instance, one alternative may provide increased habitat for deer and grouse. However, that alternative will also require increased acreage of clearcutting.

Evaluation and comparison of alternatives is discussed in detail in this chapter under Comparison of Alternatives, and in Chapter IV, Environmental Consequences.

Benchmarks

A series of benchmarks were developed to help define the limits of what could be provided in terms of resource conditions and product outputs from the Ottawa National Forest.

Benchmark analysis is done to provide the basis for developing a wide range of reasonable alternatives. Through these limits, the benchmarks show the ability of the Forest to respond to public issues and management concerns included in the management problems. (See Chapter I.) The benchmarks also provide information on the cost of providing the goods and services from the Forest and the trade-offs associated with emphasizing one benefit value at the expense of another. (See the Final EIS Appendix Volume, Appendix B, Part 6 - Analysis Prior to Development of Alternatives, for more detailed discussions of the benchmarks and development of minimum management requirements.)

This section includes discussions of the type of benchmarks developed, a summary of benchmarks, the range of benefits that can be provided from the Forest in response to the management problems and the role of benchmarks in developing alternatives.

Benchmark Development

Benchmarks on the Ottawa National Forest were developed to display the maximum and minimum levels of outputs and benefits while meeting minimum mangement requirements. Two categories of benchmarks have been developed. The first type shows what the level of benefits will be if economic efficiency is the primary criterion. This type is further separated by whether all priced benefits are included or only market benefits, such as timber volume and developed recreation use, are included.

The second category of benchmarks show the maximum and minimum levels of resource production in response to specific management problems. For example, benchmarks were established for the maximum amount of timber that could be produced and the maximum amount of semiprimitive recreation opportunity settings.

Benchmarks Summarized

A set of benchmarks was developed to establish the potential of the Ottawa National Forest to respond to the management problems.

Table 2.2 summarizes the purpose and objective of each benchmark. A more detailed discussion of the results of individual benchmarks is provided in the Final EIS Appendix Volume, Appendix B, Part 6, Analysis Prior to the Development of Alternatives.

Table 2.2
Benchmark Themes

Benchmark Theme	Purpose and Objective
Maximize Present Net Value (BM 1)	To establish the most cost-efficient use of Forest acres within the levels of defined product demand.
Maximize Present Net Value - Market Goods Only (BM 2)	To determine the most efficient level of market goods production where only market outputs are valued. This benchmark also identifies which timber options considered for each analysis area are most efficient from a Forestwide perspective.
Maximize Present Net Value-Maintain Current Vegetative Composition (BM 3)	To examine ability of the Forest to produce a desired mix of timber products and other benefits without conversion of vegetative type. Identifies how this vegetative condition ranks in efficiency and nonmeasured benefits with other management options that utilize type conversion.
Maximize Present Net Value-Timber Rollover (BM 4)	To establish the most economically efficient management actions for meeting the maximum level of timber production. Reflects the value of market and nonmarket benefits, management cost, and the power of these factors in altering the solution in the maximize timber volume benchmark.
Maximize Present Net Value-Timber Opportunity (BM 5)	To establish the opportunity cost of having limited timber demand. Establishes what level of timber production and management intensity would result in the greatest economic return, given unlimited demand for timber products.
Maximize PNV -Semiprimitive Emphasis (Max. Wilderness) (BM 6)	To establish the most efficient management of the Forest while providing large amounts of semiprimitive recreation opportunities and habitat for wildlife species with seclusion needs. This benchmark also includes the maximum amount of wilderness considered possible on the Forest.
Least Cost Meeting Timber Demand (BM 7)	To determine the minimum discounted cost of providing a level of total timber output that is equal to at least 90 percent of the total volume of timber demand expected.
Current Direction (No Change) (BM 8)	To predict the level of goods and services that would be produced over time if current direction continues.
Minimum Level Management (BM 9)	To define a reference point for comparison of results from discretionary or controllable management activities and investments. This benchmark represents the cost and outputs associated with protection and those management activities and investments where there is little or no management discretion as to the amount and location.
Maximize Timber Volume (BM 10)	To demonstrate the ability of the Forest to produce timber with no ceilings on timber production and no efficiency requirement.

Table 2.2 (continued)

Benchmark Theme	Purpose and Objective
Maximize Volume-Softwood Sawtimber (BM 11)	To estimate the potential of the Forest to produce softwood sawtimber volume. Establish the cost and efficiency of converting the existing vegetative composition to one that emphasizes softwoods. Identify the primary trade-offs associated with moving toward a softwood-dominated forest.
Maximize Volume-Hardwood Sawtimber With Uneven-aged Management (BM 12)	To determine the maximum level of hardwood sawlog production that can be sustained while emphasizing uneven-aged management of the hardwood type. To identify trade-offs and benefits associated with an uneven-aged emphasis in terms of the production of market and nonmarket benefits, with particular interest in comparison with the even-aged management of hardwoods emphasis benchmark, BM 13.
Maximize Volume-Hardwood Sawtimber With Even-Aged Management (BM 13)	To determine the maximum level of hardwood sawlog production that can be sustained while emphasizing even-aged management of the hardwood type. To identify the trade-offs and benefits associated with even-aged emphasis in terms of the production of market and nonmarket benefits. This benchmark is of particular interest when compared with the benchmark which emphasizes uneven-aged management.
Maximize Volume Aspen with Emphasis on Game Habitat (BM 14)	To determine the maximum level of aspen timber product that can be sustained while emphasizing the production of habitat for game species of wildlife.

Range of Benefits That Can be Provided

The benchmarks determined the maximum and minimum limits of the resource outputs that can be provided. The ability of a benchmark to respond favorably to the management problems is described in terms of how the benchmark responds to the goals pertinent to the management problems.

The Final EIS Appendix Volume, Appendix B, Part 6 - Analysis Prior to The Development of Alternatives, contains a more detailed discussion of the results of individual benchmarks and the range of cost and benefits that could be produced from the Forest.

Each of these benchmarks meets minimum management requirements. Responses to management problems are measured in terms of key measurements of goals that were developed to respond to the management problems. The actual range of management responses represented among the benchmarks is displayed below. The range of responses includes the minimum level management response, plus the minimum and maximum response exclusive of the minimum level response. Benchmark number is indicated in parenthesis adjacent to the measure of response.

Problem 1 - Transporation

The range of response to the transportation problem was measured in terms of how much new local road construction would be required, what mix of road standards is planned, and what long-term mix of ROS classes would be provided. Goals 5 and 7 and their associated key measurements were designed in part to address the transportation problem.

Goal Theme 5

Provide a local transportation system that provides a mix of road standards and density that is appropriate to manage for access for a variety of recreational opportunities, to provide for transportation of timber in a timely manner, to provide for a mix of ROS classes, and to provide for endangered and threatened species habitat. Refer to Final EIS Appendix Volume, Appendix H.

	Range of Possible Management Responses		
Key Measurement	Minimum Level (BM 9)	Low Response 1/	Maximum Response
ROS Class Acreage	(thousand acres)		
Roaded Natural	660	472 (BM 6)	877 (BM 10-14)
Semiprimitive motorized	170	0 (BM 8,10-14)	272 (BM 6)
Semiprimitive nonmotorized	96	49 (BM 10-14)	182 (BM 6)
Local Road Construction (miles/year)			
Winter-only	0	7	73
Winter/dry summer	0	6	60
Summer-normal	0	4	50
Total	0	17 (BM 7)	183 (BM 10)

1/ Represents the minimum response among the benchmarks exclusive of the minimum level benchmark.

Goal Theme 7

Manage the Forest in an economically efficient manner.

Key Measurement	Range of Possible Management Responses: Minimum Level (BM 9)	Low Response 1/	Maximum Response
	(millions of 1978 dollars)		
PNV (assigned values)	146	198 (BM 10)	303 (BM 5)

Problem 2 - Wildlife Management

The range of response to the wildlife management problem was measured in terms of the acreage of aspen type maintained, the acreage of thermal cover, the mix of even-aged and uneven-aged hardwoods, the spatial distribution of aspen harvest, the conversion to pine, the ROS class mix, and the acreage of temporary openings.

Goals 1, 2, 3, 4, 5, and 8 and their associated key measurements were designed in part to respond to the wildlife problem.

Goal Theme 1

Provide for a diverse range of vegetative composition through management of aspen, short-rotation conifers, long-rotation conifers, and hardwoods to provide a variety of recreation opportunities, visual variety, timber products, and wildlife habitats.

Key Measurement	Range of Possible Management Responses: Minimum Level (BM 9)	Low Response 1/	Maximum Response
	(thousand acres maintained long-term)		
Acres of aspen type maintained	0	35 (BM 2)	322 (BM 14)
Thermal cover acreage	168	107 (BM 14)	273 (BM 11)

Goal Theme 2

Manage northern hardwoods to create a mixture of vegetative communities (species, structure, age class) that produce a variety of recreation settings, visual variety, timber products, and wildlife habitats over the planning horizon.

Key Measurement	Range of Possible Management Responses: Minimum Level (BM 9)	Low Response 1/	Maximum Response
	(thousand acres)		
Even-aged hardwood management acreage	0	132 (BM 11)	289 (BM 13)
Uneven-aged hardwood management acreage	0	49 (BM 7)	252 (BM 12)
Average annual timber production (2 decades)	(million cubic feet per year)		
Aspen products	0	2.7 (BM 2)	6.7 (BM 10)
Hardwood sawtimber	0	1.6 (BM 7)	7.8 (BM 11)
Total timber	0	14.4 (BM 7)	38.9 (BM 10)
Average annual timber production (5 decades)	(million cubic feet per year)		
Aspen products	0	1.4 (BM 2)	6.9 (BM 14)
Hardwood sawtimber	0	3.4 (BM 7)	10.0 (BM 13)
Total timber	0	19.7 (BM 7)	42.0 (BM 10)

Goal Theme 3

Distribute and schedule vegetative management practices to provide a steady flow of timber to markets and improve wildlife habitat where benefits are greatest.

Key Measurements	Range of Possible Management Responses		
	Minimum Level (BM 9)	Low Response 1/ (BM 2)	Maximum Response (BM 14)
	(average annual acres)		
Aspen regeneration by wildlife opportunity group (first 2 decades)			
High opportunity area (53% of Forest)	0	1,090	4,267
Medium opportunity area (25% of Forest)	0	0	2,773
Low opportunity area (22% of Forest)	0	0	1,910
Total	0	1,090	8,950

Goal Theme 4

Carry out reforestation activities with emphasis on natural regeneration and with prudent use of chemicals.

Key Measurements	Range of Possible Management Responses: Minimum Level (BM 9)	Low Response 1/	Maximum Response
	(average annual acres)		
Artificial reforestation (2 decades)	0	0 (BM 7)	9,050 (BM 11)
Natural reforestation with site prep. (2 decades)	0	960 (BM 8)	8,370 (BM 14)
Conifer release (2 decades)	0	0 (BM 7)	12,550 (BM 14)
Conversion to spruce-red and white pine (2 decades)	0	0 (BM 7)	8,600 (BM 14)

Goal Theme 8

Manage an appropriate amount of temporary openings (clearcuts) to achieve integrated resource management objectives.

Key Measurements	Range of Possible Management Responses: Minimum Level (BM 9)	Low Response 1/	Maximum Response
	(average annual acres)		
Temporary openings (2 decades)			
Clearcuts	0	1,790 (BM 2)	10,295 (BM 11)
Other (seed/ removal)	0	1,750 (BM 3)	7,590 (BM 13)
Total	0	4,050 (BM 3)	13,200 (BM 10)

Problem 4 - Vegetation Management

The range of response to the vegetation problem was measured in terms of the amount of temporary opening, the amount and location of chemical use, species/product mix and amount, and economic efficiency. Goals 1, 2, 4, 7, and 8 and their associated key measurements are designed in part to address the vegetation management problem.

See problems 1 and 2 for description of goals, key measurements, and range of response represented among the benchmarks.

Problem 5 - Wilderness

The range of response to the wilderness problem was measured in terms of the amount and location of recommended wilderness or wilderness study. Goal 6 and associated key measurement are designed to address the wilderness problem.

Goal Theme 6

Provide for wilderness designation and/or study.

	Range of Possible Management Responses		
Key Measurement	Minimum Level (BM 9)	Low Response 1/	Maximum Response
	(thousand acres)		
Recommended wilderness or wilderness study acreage	0	0 (BM 3, 5, 10-14)	58.0 (BM 6)

Role of Benchmarks in Developing Alternatives

The results of benchmark analysis were used to define the limits of resource potentials, identify what the primary tradeoffs were, identify opportunities to increase economic efficiency, and identify competetive and complementary relationships among issues, concerns, and opportunities.

Significant results identified during benchmark analysis were:

- Reductions in the acreage of aspen management increases PNV and reduces the acreage of clearcutting. However, habitat for deer and grouse would be reduced.

- Emphasis on even-aged management of hardwoods and regeneration harvest in the early decades increases overall efficiency and also increases hardwood sawtimber production in the early decades. However, the acreage of temporary opening would be increased significantly, resulting in potential impacts on visual and recreation resources.

- Emphasis on low standard roads increases economic efficiency overall. However, the efficiency or flexibility of transporting timber products to market would be reduced. Low standard roads would also require closure to use during wet periods to avoid damage.

- Higher road densities may increase accessibility and efficiency in production of market goods and roaded natural recreation uses. However, a highly roaded forest would reduce the amount of semiprimitive recreation opportunities, and habitat for wildlife species that require remoteness.

- Emphasis on prescriptions with a nonmarket emphasis could increase the potential production of nonmarket goods, such as wildlife habitat and wildlife-based recreation. However, the higher cost of practices generally results in reduction in PNV.

- Emphasis on even-aged management of hardwoods provides an opportunity to increase diversity of plant and animal communities within the hardwood type. However, to increase the relative amount of mid-tolerant species would require increased expenditures in reforestation practices and a reduction in PNV, and would increase the acreage of temporary openings created during any given decade.

- Timber sale activities could be emphasized in areas of the Forest where market demand is greater or where opportunities to improve habitat for deer and grouse are greater. However, emphasizing timber sales in these areas may require higher cost and result in reduced PNV.

- The acreage of aspen can be increased and provide increased habitat for game species of wildlife. However, if aspen acreage is increased substantially, the acreage of critical thermal cover types such as balsam fir may be reduced and be more costly to establish.

- The level of timber supply and long-term sustained yield of timber volume could be increased if existing roadless areas are managed for timber production. However, timber demands for products can be met without the use of these same acres. Further, significantly more volume of most species/products groups can be supplied than demanded without consideration of roadless areas.

- Timber productivity and long-term sustained yield could be increased significantly from present potential. However, this would require increased type conversions, artificial reforestation, and increased use of herbicides. Cost would also increase significantly and result in reduced PNV.

- As a result of the analysis of benchmarks, a markedly improved understanding of Forest problems was developed. This understanding was built out of two products. First, the simple resource capabilities and potentials of the Forest as a single producing unit were better understood. (See this chapter, Range of Benefits That Can be Provided.) Also, the impact of emphasizing the production of one good or condition on another (tradeoffs) and the impact of that production on PNV (opportunity cost) was better understood. As a result, each alternative was developed focusing on those resource features or management activities that, when controlled, would have the strongest impact on shaping responses to a Forest problem(s).

- The benchmark analysis helped define the limits within which resource benefits could be provided and helped the the Forest interdisciplinary team to better understand the magnitude of trade-offs associated with emphasizing one resource output over another. Alternatives differ from benchmarks in that they are limited by resource demand or need, and each alternative was designed to respond specifically to one or more of the management problems.

Development of Alternative Forest Plans

The range of alternatives provides different ways of responding to the conflicting desires shown in the management problems. Specific objectives for each alternative have been identified, such as acres of certain types of land managed for nonmotorized recreation and the desired diversity of vegetative types. Given these objectives, the FORPLAN model was used to select the most economically efficient set of management precriptions to meet the goals and objectives of the alternative. Detailed discussion of the modeling assumptions for each alternative is in the Final EIS Appendix Volume, Appendix B, Part 7 - Formulation of Alternatives.

Each alternative satisfies the principle of "integrated resource management." The essence of this principle is that no resource is emphasized to the exclusion or violation of the minimum standards for other resources. For example, all alternatives protect soil productivity and ensure that minimum viable wildlife populations are maintained.

Even though all alternatives consider cost efficiency, the goals and objectives for each are different. Each alternative uses a combination of management prescriptions that produce the highest net economic benefit (the highest difference of benefits minus costs) possible while still achieving the objectives of that alternative.

Wide Range of Alternative Forest Plans

A wide range of alternatives was developed. The eight alternatives developed provide clearly different ways of responding to the major public issues, management concerns, and resource opportunities identified during the planning process.

Although each alternative emphasizes a different set of objectives and responds differently to the problems, some may produce similar levels of some benefits. One reason for this similarity is that the Forest's capacities for providing resource outputs, such as recreation use and timber harvest, exceed demands. The benchmark analysis showed that higher levels of these outputs could be produced in the future if public demands increase.

While some benefits are similar, other benefits vary widely. For example, the total amount of timber harvested is similar in several alternatives. However, the species harvested and the kinds of wood products provided vary. Comparing the range of alternatives requires careful attention to the detail shown later in this chapter under the heading "The Forest Plan Alternatives."

The key to ensuring a wide range of alternatives was to define the range of response to the problems that was based on the range of public comment and management concern. It was important to express the range of response in terms of the themes for the goals. Through this approach, each alternative could be defined, controlled, measured, and compared to one another in the same terms.

The range of responses to the management problems, among the alternatives, is presented below. The range of responses is presented in terms of goal themes.

Goal 1 Range of Responses Among Alternatives

The amount of aspen type maintained ranges from a low level based on economic efficiency to a high level driven by public concern for more deer and grouse and meeting demand for aspen products. Under at least one alternative, aspen type was increased to provide for more game habitat and provide a high output of aspen products.

In at least one alternative, the amount of thermal cover was maintained or increased so that it made up 18 percent to 25 percent of the land area in high and medium wildlife opportunities areas.

Among the range of alternatives, at least one alternative attempted to meet the demand for each individual species/product group for the first 5 decades.

Goal 2 Range of Responses Among Alternatives

The range of acreage managed uneven-aged ranges from a low driven by maximizing PNV and meeting short-term demands for hardwood products to a high driven by a concern over creating temporary openings (clearcuts) and the impacts on visual quality.

Goal 3 Range of Responses Among Alternatives

The range of alternatives included at least one alternative that emphasized aspen regeneration in high and medium wildlife opportunity areas.

Goal 4 Range of Responses Among Alternatives

Alternatives range from a low of no chemical use to a high that would require some chemical use to meet softwood product demands and provide for future supplies of softwood products and vegetative diversity.

Goal 5 Range of Responses Among Alternatives

The range of alternatives includes one that has a maximum amount of suitable acreage managed under management area prescriptions 6.1 and 6.2 (semiprimitive nonmotorized and semiprimitive motorized ROS classes).

Goal 6 Range of Responses Among Alternatives

Alternatives range from one with no wilderness designation or wilderness study to one with all existing roadless areas being recommended for wilderness designation or wilderness study. Among all the alternatives, individual roadless areas were recommended for all of the following possible forms of management:

Area	Possible Management
Sturgeon	Nonwilderness, wilderness study, or wilderness designation
Sylvania	Nonwilderness or wilderness study
Norwich	Nonwilderness or wilderness study
McCormick	Nonwilderness or wilderness study

Goal 7 Range of Responses Among Alternatives

Alternative 1 was developed to maximize PNV.

All other alternatives were evaluated against alternative 1 and activities/cost that reduce PNV were identified and documented.

Goal 8 Range of Responses Among Alternatives

Alternatives range from one where no clearcutting was allowed to an upper amount of clearcutting which was driven by economic efficiency and/or increasing deer/grouse habitat.

Alternatives Considered But Eliminated From Detailed Study

The following alternatives were formulated and analyzed, but were eliminated from any further detailed study.

An alternative emphasizing the production of quality softwood sawtimber was proposed and eliminated from further consideration. Public issues and management concerns, the basis for the design of alternatives, did not call for increased softwood sawtimber volume production. Furthermore, no emphasis was placed on it by the timber industry. Public concerns about vegetation mangement involving chemical use and the high costs of softwood reforestation actually ran counter to a softwood sawtimber emphasis alternative. Other alternatives satisfied estimated demands for softwood sawtimber.

The NFMA planning regulations permit alternatives that could require a change in law or policy in order to respond to public isues. There were no such alternatives needed for the Forest. All issues addressed in Forest planning can be satisfied within the range of alternatives considered in detail in the following section.

Forest Plan Alternatives Considered in Detail

This section describes the eight alternatives considered in detail. These represent different ways of managing the Forest to provide public benefits. Each of the alternatives considered in detail is a technically and legally feasible strategy for managing the Forest.

Each alternative includes consideration and coordination of all the uses of the Forest. A variety of resource conditions and outputs are provided on a sustained yield basis, including visual quality, recreation opportunities, timber products, wildlife habitat, water quality, soil productivity, wilderness, and minerals.

Where to Find Information About the Alternative Forest Plans

The detailed information necessary to explain each alternative is contained in a number of places in this document. First, a description of each alternative is contained in the pages that follow.

Second, the acreage selected for management areas under each alternative, and the land and resource conditions that would result are shown in Table 2.11.

Third, a set of maps showing management area locations by alternative is in the enclosed map packet. The maps are useful in understanding how the selection and location of management areas changes between alternatives.

Fourth, comparisons among alternatives are included in the last section of this chapter. Comparisons of priced benefits, quantitative benefits, cost efficiency, and environmental consequences are helpful in differentiating among alternatives and in judging their net public benefits.

Finally, a detailed discussion of the alternatives' environmental consequences is in Chapter IV. This discussion is helpful for understanding the comparisons made in this chapter.

Further information on the alternatives is contained in the following locations.

Alternatives Considered - Descriptions in the following section of this chapter and the Final EIS Appendix Volume, Appendix B.

Management Area Selection - Table 2.11 of this document and in the Forest Plan Chapter III (detailed management area descriptions and management area prescriptions).

Management Area Locations - Accompanying map packet, maps by alternative.

Results of the Alternatives - Later section of this chapter, "Comparison of Alternatives," and Final EIS Appendix Volume, Appendix B, Part 8.

Effects of the Alternatives - Final EIS, Chapter IV, Environmental Consequences.

Summary of the Alternatives

The following is a brief description of the alternatives that were considered in detail. The alternatives are described in more detail later in this chapter.

Alternative 1 maximizes present net value of priced benefits while meeting legal requirements. It also responds to concern for economic efficiency.

Alternative 2 (current direction, no action) is a projection of many current management direction features into the future. This is considered the "no-action" alternative.

Alternative 3 emphasizes wildlife habitat with particular emphasis on habitat for deer and grouse. It responds to public concern for deer and grouse and aspen timber product.

Alternative 4 emphasizes semiprimitive recreation opportunities and wilderness. It responds to wilderness and roads issue.

Alternative 5 emphasizes management of the Forest without the use of chemicals or even-aged management. It responds to clearcutting and chemical use issues.

Alternative 6 (RPA) emphasizes uneven-aged management of hardwoods for hardwood sawtimber production and associated wildlife species. It responds to concerns about hardwood timber management.

Alternative 7 (preferred) emphasizes habitat for game and nongame species of wildlife. It provides a wide variety of vegetative conditions, recreation opportunities, and mix of Forest timber products. It responds to wilderness, roading, and game habitat issues and even-aged/uneven-aged management concerns. Pages I-21 to 25 discuss the changes made to the final plan following public comment on the proposed plan.

Alternative 8 emphasizes a variety of vegetative conditions and recreation opportunities, while providing moderate amounts of habitat for game and nongame species of wildlife. It responds to wilderness and roadless area issues, roading issues, and even-aged/ uneven-aged management concerns.

The Forest Plan Alternatives

Each of the following alternatives is feasible and could be developed as the Forest Plan. Each alternative is described by (1) stating its purpose and goals in response to management problems, and (2) a table summarizing its significant effects.

The resolution of management problems is represented in terms of how the alternatives respond to the problems. Each of the alternatives responds to the management problems in a different way. This was done by establishing goals designed to address each of the management problems. Each of the goals is designed to provide a different amount of the benefits within the range that can be provided in response to each management problem (see

the section of this chapter entitled Wide Range of Alternative Forest Plans). Each alternative has eight goals which in aggregate respond to the management problems. Refer to Table 2.1 to review the relationship between the theme for goal statements and management problems.

Each of the alternatives incorporates the management prescriptions described in Appendix B, Part 3, of the Appendix Volume and Chapter IV of the Forest Plan. Measures to mitigate potential adverse environmental effects are included in the management area prescriptions. A more detailed discussion of mitigating measures is in Chapter IV of this document.

For example, each alternative addresses the wilderness issue in some manner. Responses to the wilderness goal range from no recommended wilderness study to a maximum wilderness study of approximately 57,700 acres. The alternatives together constitute a spectrum of wilderness study and/or designated wilderness.

All of the alternatives address the wild/scenic inventory rivers in the same manner, as described in the following paragraphs. This explanation will not be repeated for each alternative.

Fifteen candidate rivers are listed on the former Heritage Conservation and Recreation Service January 1981 inventory for study for potential designation as National Wild, Scenic, or Recreational rivers. A total of 349 miles of river encompasses 49,200 acres of National Forest System lands, in a 1/4-mile wide corridor on each side, of the river.

Preliminary analysis recommends that some of these rivers be studied for all potential designations while others be protected only for potential scenic and recreational or recreational only designation. (See Final EIS Appendix Volume, Appendix D - Wild and Scenic River Evaluations, Table D.2)

The major management concern is that the rivers and their respective values within the river corridor are protected until a formal study of each is completed.

Rivers and their 1/4-mile-wide corridor on each side being protected for study as potential candidates for wild, scenic, or recreational designation will be managed/protected under management area prescription 9.3.

Display of Alternatives

The following pages describe the eight alternatives that resulted from the Forest's efforts to resolve management problems in an efficient way. The primary goals of each alternative are marked with an *. (See the Final EIS Appendix Volume, Appendix B-Part 8, and the comparison of alternatives later in this chapter for more detail.)

Alternative 1 - Maximize PNV

Purpose

To identify the mix of resource uses and the schedule of outputs and costs that maximize present net value. The primary goal of this alternative is to manage the Forest in the most economically efficient manner.

The long-term vegetative composition, the mix of timber products, and wildlife and recreation benefits were determined solely on the basis of economic returns.

Goals in Response to Management Problems

Problem 1 - Transportation

Goal 5 - Provide for a low to moderate amount of local road construction. Emphasize lower standard roads and winter logging. Provide moderate amounts of semiprimitive motorized and semiprimitive nonmotorized ROS classes.

* Goal 7 - Provide the highest present net value possible while meeting all legal requirements.

Problems 2 and 4 - Wildlife and Vegetation

Goal 1 - Emphasize management of northern hardwoods and short-rotation conifers. Maintain a low to moderate amount of aspen type along with a high amount of thermal cover types. Emphasize even-aged regeneration harvest of hardwoods in the early decades. Regenerate a relatively large acreage of hemlock and swamp conifer types over the planning horizon. Harvest and regenerate a large amount of hemlock in the first decade. Harvest the majority of the swamp conifer type in later decades. Emphasize production of hardwood and softwood timber products. Produce a relatively low amount of aspen products.

Goal 2 - Provide a mix of even-aged and uneven-aged management of northern hardwoods, with emphasis on even-aged management (72 percent of the hardwoods managed for timber production). Minimize investments in intensive even-aged management.

Goal 3 - Concentrate vegetative management activities in areas with low road cost.

Goal 4 - Favor natural reforestation and low amounts of chemical use. Discriminate against artificial reforestation due to the high cost and low rate of return on the investment.

Goal 8 - Create a relatively large amount of temporary opening with emphasis on shelterwood cutting rather than clearcutting. Emphasize even-aged harvest cutting in the early decades. Maintain aspen harvest at current levels. Increase harvest of balsam fir-jack pine significantly.

Problem 5 - Wilderness

Goal 6 - Recommend Sturgeon Gorge, Sylvania, and Cyrus H. McCormick Experimental Forest for wilderness study. Recommend Norwich Plains for nonwilderness uses.

Table 2.3
Significant Results/Benefits of Alternative 1

Results/Benefits	Units	Outputs/Condition
Economic and Social Effects		
Present net value	Thousand dollars1/	274,836
Average annual budget in first/fifth decade	Thousand dollars	3,845/4,787
Average annual returns to treasury in first/fifth decade	Thousand dollars	1,688/4,951
Average annual payments to counties in first/fifth decade	Thousand dollars	787/1,238
Average annual nonmarket priced benefits first/fifth decade	Thousand dollars	9,400/13,700
Average annual recreation use by ROS class over first 2 decades	Thousand RVDs	
Semiprimitive nonmotorized		41
Semiprimitive motorized		79
Roaded natural (Dispersed)		634
(Developed)		268
Wildlife-based recreation	Thousand RVDs	976
Fishing	Thousand RVDs	126
Problem 1 - Transportation		
Average miles of local road construction per year by standard (first 2 decades)	Miles	
Winter only		12
Winter/dry summer		10
Summer normal		7
Total		29
Acres by ROS class	Thousand acres	
Semiprimitive nonmotorized		146
Semiprimitive motorized		141
Roaded natural		639
Problems 2 and 4 - Wildlife and Vegetation		
Aspen acreage maintained	Thousand acres	97
Thermal cover acreage	Thousand acres	160
Even-aged hardwood management	Thousand acres	289
Uneven-aged hardwood management	Thousand acres	114
Average annual timber volume (first 2 decades)	Million cubic feet	
Aspen products		2.7
Hardwood sawtimber		2.9
Total timber		16.0

Table 2.3 (continued)

Results/Benefits	Units	Outputs/Condition
Average annual timber volume (first 5 decades)	Million cubic feet	
Aspen products		4.2
Hardwood sawtimber		4.1
Total timber		21.9
Average annual aspen regeneration by wildlife opportunity group (first 2 decades)	Acres	
High opportunity area		530
Medium opportunity area		90
Low opportunity area		220
Total		840
Average annual artificial reforestation (first 2 decades)	Acres	100
Average annual natural reforestation with site prep. (first 2 decades)	Acres	2,500
Average annual conifer release (first 2 decades	Acres	---
Average annual conversion to spruce-red and white pine (first 2 decades)	Acres	---
Average annual clearcut acreage (first 2 decades)	Acres	2,060
Average annual total temporary opening (first 2 decades)	Acres	5,210
Problem 5 - Wilderness		
Wilderness study or designation acreage	Thousand acres	50.3

1/ All dollars in 1978 terms.

Alternative 2- (Current Direction/No Action)

Purpose

To provide many of the benefits (goods and services) over time that would be produced if current direction continues. This alternative estimates the Forest's ability to respond to future demand while under current direction and plans.

This alternative represents the management direction as it existed at the beginning of the land management planning process based on existing plans. The exception was special areas that required special study, i.e., wild/scenic inventory rivers and roadless area reevaluation. This alternative may be referred to as the "no action" alternative.

Goals in Response to Management Problems

Problem 1 - Transportation

Goal 5 - Provide for low to moderate amount of local road construction. Emphasize roaded natural ROS class over most of the Forest. Emphasize low standard roads and winter logging in the early decades.

Goal 7 - Provide the highest PNV possible, subject to constraints on budget, emphasis on aspen management, continued conversion to pine, and long-rotation management of hardwoods, spruce, and red and white pine.

Problems 2 and 4 Wildlife and Vegetation

Goal 1 - Maintain current acreage of aspen type. Increase long-rotation conifer acreage at a modest rate. Reduce acreage of short-rotation conifers. Provide for low to moderate amounts of hardwood sawtimber in the early decades. Emphasize long rotations in hardwoods and long-rotation conifers. Maintain habitat for deer and grouse at current levels.

Goal 2 - Emphasize even-aged management of hardwoods. Limit even-aged regeneration harvest of the hardwood type in early decades. Emphasize thinnings and selection cuttings in the hardwood type in the early decades.

Goal 3 - Distribute timber sale activity to areas with low road cost.

Goal 4 - Emphasize natural regeneration. Provide for a modest amount of artificial reforestation and relatively low amount of chemical use. Utilize artificial reforestation for conversion of jack pine to red pine, or conversion of low-quality aspen or hardwoods to red pine or white spruce.

Goal 8 - Create temporary openings at about the current level. Emphasize clearcutting in aspen and balsam fir-jack pine types. Limit even-aged hardwood regeneration cutting.

Problem 5 -
Wilderness

Goal 6 - Protect Sturgeon Gorge, Sylvania, and Norwich Plains roadless areas pending further wilderness study or Congressional designation as wilderness or nonwilderness.

Table 2.4
Significant Results/Benefits of Alternative 2

Results	Units	Outputs/Condition
Economic and Social Effects		
Present net value	Thousand dollars1/	243,799
Average annual budget in first/fifth decade	Thousand dollars	3,818/4554
Average annual returns to treasury in first/fifth decade	Thousand dollars	1,047/4,621
Average annual payments to counties in first/fifth decade	Thousand dollars	787/1,155
Average annual nonmarket priced benefits in first/fifth decade		8,800/13,100
Average annual recreation use by ROS class over first 2 decades	Thousand RVDs	
Semiprimitive nonmotorized		38
Semiprimitive motorized		-
Roaded natural (Dispersed)		634
(Developed)		268
Wildlife-based recreation	Thousand RVDs	941
Fishing	Thousand RVDs	126
Problem 1 - Transportation		
Average miles of local road construction per year by standard (first 2 decades)	Miles	
Winter only		10
Winter/dry summer		10
Summer normal		8
Total		28
Acres by ROS class	Thousand acres	
Semiprimitive nonmotorized		106
Semiprimitive motorized		0
Roaded natural		820
Problems 2 and 4 - Wildlife and Vegetation		
Aspen acreage maintained	Thousand acres	116
Thermal cover acreage	Thousand acres	137
Even-aged hardwood management	Thousand acres	272
Uneven-aged hardwood management	Thousand acres	62
Average annual timber volume (first 2 decades)	Million cubic feet	
Aspen products		3.2
Hardwood sawtimber		1.6
Total timber		14.0

Table 2.4 (continued)

Results/Benefits	Units	Outputs/Condition
Average annual timber volume (first 5 decades)	Million cubic feet	
Aspen products		4.1
Hardwood sawtimber		3.6
Total timber		20.1
Average annual aspen regeneration by wildlife opportunity group (first 2 decades)	Acres	
High opportunity area		1,310
Medium opportunity area		0
Low opportunity area		320
Total		1,630
Average annual artificial reforestation (first 2 decades)	Acres	600
Average annual natural reforestation with site preparation (first 2 decades)	Acres	1,800
Average annual conifer release (first 2 decades)	Acres	150
Average annual conversion to spruce-red and white pine (2 decades)	Acres	550
Average annual clearcut acreage (first 2 decades)	Acres	3,270
Average annual total temporary opening (first 2 decades)	Acres	4,420
Problem 5 -Wilderness		
Wilderness designation or study acreage	Thousand acres	37.4

1/ All dollars are in 1978 terms.

Alternative 3

Purpose

To increase the capacity of the Forest to support increased populations of white-tailed deer and ruffed grouse. This alternative emphasizes management of the aspen type while maintaining conifer cover to provide wildlife (game) habitat and provide aspen timber products. This alternative is also the minimum wilderness acreage alternative.

Goals in Response to Management Problems

Problem 1 - Transportation

Goal 5 - Provide for a low amount of local road construction with emphasis on low-standard roads. Emphasize roaded natural ROS class with a modest amount of semiprimitive motorized and a moderate amount of semiprimitive nonmotorized ROS classes.

Goal 7 - Provide the highest PNV possible given the increased emphasis on aspen management, increased expenditures on nonmarket prescriptions, increased emphasis on spatial distribution, and reduced emphasis on wilderness.

Problems 2 and 4 - Wildlife and Vegetation

* Goal 1 - Increase aspen type acreage 10 to 20 percent Forestwide. Maintain and manage an adequate amount of conifer thermal cover types. Regenerate swamp conifer and hemlock types in later decades.

Goal 2 - Emphasize even-aged management of hardwoods (90 percent of the hardwoods managed for timber production) with regeneration harvest beginning in the later decades.

* Goal 3 - Emphasize aspen and conifer cover on high and medium wildlife opportunity areas. Emphasize nonmarket intensities in high and medium wildlife opportunity areas.

Goal 4 - Emphasize natural regeneration of aspen, balsam fir, and jack pine. Convert a considerable amount of hardwoods, balsam fir, and jack pine to aspen in the early decades. Limit the amount of chemicals used.

Goal 8 - Provide a large acreage of temporary opening. Emphasize aspen, balsam fir, and jack pine clearcutting in early decades and even-aged management hardwood regeneration harvest in later decades.

Problem 5 -
Wilderness

Goal 6 - Manage as nonwilderness all roadless areas including Sylvania, Sturgeon Gorge, Cyrus H. McCormick Experimental Forest, and Norwich Plains.

Table 2.5
Significant Results/Benefits of Alternative 3

Results/Benefits	Units	Outputs/Condition
Economic and Social Effects		
Present net value	Thousand dollars1/	241,944
Average annual budget in first/fifth decade	Thousand dollars	3,831/4,879
Average annual returns to treasury in first/fifth decade	Thousand dollars	1,203/4,826
Average annual payments to counties in first/fifth decade	Thousand dollars	787/1,207
Average annual nonmarket price benefits in first/fith decade	Thousand dollars	9,100/13,500
Average annual recreation use by ROS class over first 2 decades	Thousand RVDs	
Semiprimitive nonmotorized		41
Semiprimitive motorized		152
Roaded natural (Dispersed)		634
(Developed)		268
Wildlife-based recreation	Thousand RVDs	976
Fishing	Thousand RVDs	126
Problem 1 - Transportation		
Average miles of local road construction per year by standard (first 2 decades)	Miles	
Winter only		11
Winter/dry summer		9
Summer normal		8
Total		28
Acres by ROS class	Thousand acres	
Semiprimitive nonmotorized		150
Semiprimitive motorized		55
Roaded natural		721
Problems 2 and 4 - Wildlife and Vegetation		
Aspen acreage maintained	Thousand acres	186
Thermal cover acreage	Thousand acres	140
Even-aged hardwood management	Thousand acres	258
Uneven-aged hardwood management	Thousand acres	30
Average annual timber volume (first 2 decades)	Million cubic feet	
Aspen products		4.6
Hardwood sawtimber		1.4
Total timber		15.9

Table 2.5 (continued)

Results/Benefits	Units	Outputs/Condition
Average annual timber volume (first five decades)	Million cubic feet	
Aspen products		6.2
Hardwood sawtimber		3.0
Total timber		21.6
Average annual aspen regeneration by wildlife opportunity group (first 2 decades)	Acres	
High opportunity area		3,350
Medium opportunity area		1,470
Low opportunity area		530
Total		5,350
Average annual artificial reforestation (first 2 decades)	Acres	---
Average annual natural reforestation with site preparation (first 2 decades)	Acres	4,700
Average annual conifer release (first 2 decades)	Acres	---
Average annual conversion to spruce-red and white pine (first 2 decades)	Acres	---
Average annual clearcut acreage (first 2 decades)	Acres	5,740
Average annual total temporary opening (first 2 decades)	Acres	5,770
Problem 5 - Wilderness		
Wilderness study or designation acreage	Thousand acres	0

1/ All dollars in 1978 terms.

Alternative 4

Purpose

To emphasize a Forest environment with reduced road density and large areas of semiprimitive nonmotorized and semiprimitive motorized recreation opportunities (ROS classes). This is also the maximum wilderness acreage alternative.

Goals in Response to Management Problems

Problem 1 - Transportation

* Goal 5 - Emphasize semiprimitive motorized and nonmotorized ROS classes. Increase the amount of roads (areas) intermittently closed to motorized use. Provide for moderate to high amounts of road construction outside of semiprimitive areas. Reduce emphasis on providing access for motorized recreation and moving timber products to market efficiently. Increase semiprimitive recreation opportunities and potential habitat for wildlife species requiring remoteness.

Goal 7 - Provide the highest PNV possible given the increased acreage of semiprimitive ROS, increased acreage of uneven-aged management hardwoods, and extended rotations in hardwoods and long-rotation conifers.

Problems 2 and 4 - Wildlife and Vegetation

Goal 1 - Emphasize northern hardwood and short-rotation conifer management. Reduce acreage of aspen management. Emphasize uneven-aged management of hardwooods and longer rotations of other types in semiprimitive areas. Provide a reduced amount of habitat for deer and grouse.

* Goal 2 - Provide a balanced mix of even-aged and uneven-aged management northern hardwoods, with emphasis on uneven-aged management within semiprimitive areas and even-aged management elsewhere.

Goal 3 - Reduce the amount of timber sale activity in semiprimitive areas. Increase timber sale activity in roaded natural areas.

Goal 4 - Emphasize natural regeneration. Provide for a very limited amount of chemical use.

Goal 8 - Create moderate amounts of temporary opening. Emphasize temporary openings outside of semiprimitive areas.

Problem 5 -
Wilderness

* Goal 6 - Recommend all roadless areas for wilderness study including Sturgeon Gorge, Sylvania, Cyrus H. McCormick Experimental Forest, and Norwich Plains.

Table 2.6
Significant Results/Benefits of Alternative 4

Results/Benefits	Units	Outputs/Condition
Economic and Social Effects		
Present net value	Thousand dollars 1/	267,038
Average annual budget in first/fifth decade	Thousand dollars	3,770/4,562
Average annual returns to treasury in first/fifth decade	Thousand dollars	1,421/4,923
Average annual payments to counties in first/fifth decade	Thousand dollars	787/1,231
Average annual nonmarket priced benefits in first/fifth decade	Thousand dollars	9,400/13,400
Average annual recreation use by ROS class over first 2 decades	Thousand RVDs	
Semiprimitive nonmotorized		41
Semiprimitive motorized		152
Roaded natural (Dispersed)		634
(Developed)		268
Wildlife-based recreation	Thousand RVDs	938
Fishing	Thousand RVDs	126
Problem 1 - Transportation		
Average miles of local road construction per year by standard (2 decades)	Miles	
Winter only		14
Winter/dry summer		10
Summer normal		9
Total		33
Acres by ROS class	Thousand acres	
Semiprimitive nonmotorized		182
Semiprimitive motorized		272
Roaded natural		472
Problems 2 and 4 - Wildlife and Vegetation		
Aspen acreage maintained	Thousand acres	66
Thermal cover acreage	Thousand acres	158
Even-aged hardwood management	Thousand acres	221
Uneven-aged hardwood management	Thousand acres	160
Average annual timber volume (first 2 decades)	Million cubic feet	
Aspen products		2.7
Hardwood sawtimber		2.5
Total timber		16.0

Table 2.6 (continued)

Results/Benefits	Units	Outputs/Condition
Average annual timber volume (first 5 decades)	Million cubic feet	
Aspen products		3.5
Hardwood sawtimber		4.0
Total timber		20.9
Average annual aspen regeneration by wildlife opportunity group (first 2 decades)	Acres	
High opportunity area		660
Medium opportunity area		0
Low opportunity area		0
Total		660
Average annual artificial reforestation (first 2 decades)	Acres	100
Average annual natural reforestation with site preparation (first 2 decades)	Acres	1,600
Average annual conifer release (first 2 decades)	Acres	50
Average annual conversion to spruce-red and white pine (first 2 decades)	Acres	0
Average annual clearcut acreage (first 2 decades)	Acres	2,330
Average annual total temporary opening (first 2 decades)	Acres	5,130
Problem 5 - Wilderness		
Wilderness study or designation acreage	Thousand acres	57.7

1/ All dollars in 1978 terms.

Alternative 5

Purpose

To provide a level of goods and services possible without the use of clearcutting or other even-aged harvest cutting that create temporary openings in the Forest. No chemicals would be used for vegetation management in this alternative.

Goals in Response to Management Problems

Problem 1 - Transportation

Goal 5 - Provide for a moderate to high amount of local road construction limited to northern hardwood areas. Provide moderate to high amounts of semiprimitive ROS. Emphasize winter logging.

Goal 7 - Provide the highest PNV possible given the constraints on temporary openings, reduced timber production, and reduced capacity for wildlife RVDs.

Problems 2 and 4 - Wildlife and Vegetation

Goal 1 - Emphasize northern hardwood management. Manage aspen, short-rotation conifers, and long-rotation conifers at minimum level with limited amounts of salvage cutting. Anticipate increased mortality due to insect and disease problems. Provide for significant reductions in habitat for deer and grouse.

Goal 2 - Provide a forest dominated by uneven-aged hardwoods featuring sugar maple.

Goal 3 - Concentrate timber sale activities in the northern hardwood cover type.

* Goal 4 - Use natural reforestation only. Use no chemicals.

* Goal 8 - Create no temporary openings. Minimize visual impact or change. Minimize wildlife benefits provided through the creation of temporary openings. Assume a relatively high risk in terms of maintaining viable populations of species requiring young growth habitat such as the golden-winged warbler, magnolia warbler, eastern bluebird, and the spruce grouse.

Problem 5 -
Wilderness

Goal 6 - Recommend Sturgeon Gorge and Sylvania for wilderness study. Recommend Cyrus H. McCormick Experimental Forest and Norwich Plains for nonwilderness.

Table 2.7
Significant Results/Benefits of Alternative 5

Results/Benefits	Units	Outputs/Condition
Economic and Social Effects		
Present net value	Thousand dollars1/	201,210
Average annual budget in first/fifth decade	Thousand dollars	3,489/3,307
Average annual returns to treasury in first/fifth decade	Thousand dollars	417/2,856
Average annual payments to counties in first/fifth decade	Thousand dollars	787/787
Average annual nonmarket priced benefits in first/fifth decades	Thousand dollars	8,800/11,300
Average annual recreation use by ROS class over first 2 decades	Thousand RVDs	
Semiprimitive nonmotorized		41
Semiprimitive motorized		121
Roaded natural (Dispersed)		634
(Developed)		268
Wildlife-based recreation	Thousand RVDs	918
Fishing	Thousand RVDs	126
Problem 1 - Transportation		
Average miles of local road construction per year (first 2 decades)	Miles	
Winter only		16
Winter/dry summer		9
Summer normal		8
Total		33
Acres by ROS class	Thousand acres	
Semiprimitive nonmotorized		154
Semiprimitive motorized		216
Roaded natural		555
Problems 2 and 4 - Wildlife and Vegetation		
Aspen acreage maintained	Thousand acres	0
Thermal cover acreage	Thousand acres	141
Even-aged hardwood management	Thousand acres	0
Uneven-aged hardwood management	Thousand acres	202
Average annual timber volume (first 2 decades)	Million cubic feet	
Aspen products		0.7
Hardwood sawtimber		0.9
Total timber		7.0

Table 2.7 (continued)

Results/Benefits	Units	Outputs/Condition
Average annual timber volume (first 5 decades)	Million cubic feet	
Aspen products		0.3
Hardwood sawtimber		3.4
Total timber		8.7
Average annual aspen regeneration by wildlife opportunity group (first 2 decades)	Acres	
High opportunity area		0
Medium opportunity area		0
Low opportunity area		0
Total		0
Average annual artificial reforestation (first 2 decades)	Acres	0
Average annual natural reforestation with site preparation (first 2 decades)	Acres	0
Average annual conifer release (first 2 decades)	Acres	0
Average annual conversion to spruce-red and white pine (first 2 decades)	Acres	0
Average annual clearcut acreage (first 2 decades)	Acres	0
Average annual total temporary opening (first 2 decades)	Acres	0
Problem 5 - Wilderness		
Wilderness study or designation acreage	Thousand acres	33.2

1/ All dollars are in 1978 terms.

Alternative 6

Purpose

To provide for increased and sustained future supplies of hardwood products (sawtimber emphasis) while emphasizing uneven-aged management of the hardwood type.

Goals in Response to Management Problems

Problem 1 - Transportation

Goal 5 - Provide for relatively high amounts of local road construction with emphasis on lower standards of road. Provide moderate to high amounts of semiprimitve nonmotorized and semiprimitive motorized ROS classes. Emphasize winter logging.

Goal 7 - Provide the highest PNV possible given the reduction in even-aged hardwood harvest and sawlog production in the early decades.

Problems 2 and 4 - Wildlife and Vegetation

* Goal 1 - Emphasize management of northern hardwoods and short-rotation conifers. Reduce acreage of aspen management. Satisfy demand for hardwood products for 5 decades. Provide for a reduced amount of habitat for deer and grouse.

* Goal 2 - Emphasize uneven-aged management of hardwood type (77 percent of hardwoods managed for timber production).

Goal 3 - Distribute vegetative management activities to areas with high percentage of northern hardwoods and low cost roads.

Goal 4 - Emphasize natural reforestation and low amounts of chemical use.

Goal 8 - Create a moderate to high amount of temporary opening. Create temporary openings through final harvest cutting of aspen, balsam fir, and jack pine types.

Problem 5 -
Wilderness

Goal 6 - Recommend Sylvania for wilderness study. Recommend Sturgeon Gorge, Cyrus H. McCormick Experimental Forest, and Norwich Plains for nonwilderness.

Table 2.8
Significant Results/Benefits of Alternative 6

Results/Benefits	Units	Outputs/Condition
Economic and Social Effects		
Present net value	Thousand dollars1/	243,811
Average annual budget in first/fifth decade	Thousand dollars	3,997/4,674
Average annual returns to treasury in first/fifth decade	Thousand dollars	1,313/4,486
Average annual payments to counties in first/fifth decade	Thousand dollars	787/1,121
Average annual nonmarket priced benefits in first/fifth decade	Thousand dollars	9,200/13,100
Average annual recreation use by ROS class over first 2 decades	Thousand RVDs	
Semiprimitive nonmotorized		41
Semiprimitive motorized		94
Roaded natural (Dispersed)		634
(Developed)		268
Wildlife-based recreation	Thousand RVDs	978
Fishing	Thousand RVDs	126
Problem 1 - Transportation		
Average miles of local road construction per year by standard (first 2 decades)	Miles	
Winter only		17
Winter/dry summer		13
Summer normal		13
Total		43
Acres by ROS class	Thousand acres	
Semiprimitive nonmotorized		167
Semiprimitive motorized		167
Roaded natural		592
Problems 2 and 4 - Wildlife and Vegetation		
Aspen acreage maintained	Thousand acres	76
Thermal cover acreage	Thousand acres	164
Even-aged hardwood management	Thousand acres	48
Uneven-aged hardwood management	Thousand acres	162
Average annual timber volume (first 2 decades)	Million cubic feet	
Aspen products		3.1
Hardwood sawtimber		2.0
Total timber		15.0

Table 2.8 (continued)

Results/Benefits	Units	Outputs/Condition
Average annual timber volume (first five decades)	Million cubic feet	
Aspen products		2.7
Hardwood sawtimber		3.8
Total timber		19.4
Average annual aspen regeneration by wildlife opportunity group (first 2 decades)	Acres	
High opportunity area		500
Medium opporunity area		320
Low opportunity area		390
Total		1,210
Average annual artificial reforestation (first 2 decades)	Acres	600
Average annual natural reforestation with site preparation (first 2 decades)	Acres	1,700
Average annual conifer release (first 2 decades)	Acres	700
Average annual conversion to spruce-red and white pine (first 2 decades)	Acres	500
Average annual clearcut acreage (first 2 decades)	Acres	3,660
Average annual total temporary opening (first 2 decades)	Acres	5,430
Problem 5 - Wilderness		
Wilderness study or designation acreage	Thousand acres	18.3

1/ All dollars are in 1978 terms.

Alternative 7 (Preferred)

Purpose

To maintain or improve habitat for game and nongame species of wildlife. To provide for a wide variety of vegetative conditions, recreation opportunities, and mix of forest timber products.

Goals in Response to Management Problems

Problem 1 - Transportation

* Goal 5 - Provide for a moderate amount of local road construction with emphasis on low standard roads. Emphasize roaded natural ROS class while providing moderate amounts of semiprimitive motorized and semiprimitive nonmotorized recreation opportunities. Provide for low densities of road in semiprimitive areas.

  Goal 7 - Provide the highest PNV possible given the emphasis on aspen management, increased expenditures on nonmarket prescriptions, increased emphasis on spatial distribution, increased emphasis on uneven-aged hardwood management, and increased intensive even-aged management to maintain mid-tolerant hardwood species.

Problems 2 and 4 - Wildlife and Vegetation

* Goal 1 - Maintain a high acreage of aspen type and thermal cover in areas of the Forest with the greatest potential for deer and grouse. Increase the long-rotation conifer component at a very modest rate. Regenerate swamp conifer and hemlock types at a slightly greater rate than current. Provide moderate to high amounts of aspen products for 5 decades.

* Goal 2 - Manage northern hardwoods to provide a mix of even-aged (40 percent of the hardwoods managed for timber production) and uneven-aged (60 percent of the hardwoods managed for timber production) hardwoods. Maintain or increase diversity of tree species in the hardwood type through intensive even-aged silvicultural practices, in areas of the Forest with the greatest potential to maintain mid-tolerants and also provide for improved wildlife habitat.

* Goal 3 - Emphasize aspen and conifer cover in high and medium wildlife opportunity areas. Provide for high intensity even-aged management of hardwoods in areas with high potential for maintaining mid-tolerants and improving wildlife habitat.

Goal 4 - Emphasize natural regeneration. Provide for a low amount of artificial reforestation and very low amount of chemical use.

Goal 8 - Create a moderate to high acreage of temporary opening with emphasis on aspen, balsam fir, jack pine, and even-aged hardwood management.

Problem 5 - Wilderness

Goal 6 - Recommend Sturgeon Gorge for wilderness designation. Recommend Sylvania and Cyrus H. McCormick Experimental Forest for wilderness study. Recommend Norwich Plains for nonwilderness.

Table 2.9
Significant Results/Benefits of Alternative 7

Results/Benefits	Units	Outputs/Condition
Economic and Social Effects		
Present net value	Thousand dollars 1/	248,219
Average annual budget in first/fifth decade	Thousand dollars	4,177/4,450
Average annual returns to treasury in first/fifth decade	Thousand dollars	1,295/4,723
Average annual payments to counties in first/fifth decade	Thousand dollars	787/1,180
Average annual nonmarket priced benefits in first/fifth decade	Thousand dollars	9,221/13,368
Average annual recreation use by ROS class over first 2 decades	Thousand RVDs	
Semiprimitive nonmotorized		41
Semiprimitive motorized		29
Roaded natural (Dispersed)		634
(Developed)		268
Wildlife-based recreation	Thousand RVDs	976
Fishing	Thousand RVDs	126
Problem 1 -Transportation		
Average miles of local road construction per year by standard (first 2 decades)	Miles	
Winter only		15
Winter/dry summer		13
Summer normal		10
Total		38
Acres by ROS class	Thousands acres	
Semiprimitive nonmotorized		164
Semiprimitive motorized		51
Roaded natural		711
Problems 2 and 4 - Wildlife and Vegetation		
Aspen acreage maintained	Thousand acres	138
Thermal cover acreage	Thousand acres	150
Even-aged hardwood management	Thousand acres	113
Uneven-aged hardwood management	Thousand acres	165
Average annual timber volume (first 2 decades)	Million cubic feet	
Aspen products		4.3
Hardwood sawtimber		2.1
Total timber		16.0

Table 2.9 (continued)

Results/Benefits	Units	Outputs/Condition
Average annual timber volume (first 5 decades)	Million cubic feet	
Aspen products		5.3
Hardwood sawtimber		3.9
Total timber		21.2
Average annual aspen regeneration by wildlife opportunity group (first 2 decades)	Acres	
High opportunity area		1,660
Medium opportunity area		962
Low opportunity area		630
Total		3,252
Average annual artificial reforestation (first 2 decades)	Acres	525
Average annual natural reforestation with site preparation (first 2 decades)	Acres	3,800
Average annual conifer release (first 2 decades)	Acres	650
Average annual conversion to spruce-red and white pine (first 2 decades)	Acres	325
Average annual clearcut acreage (first 2 decades)	Acres	4,860
Average annual total temporary opening (first 2 decades)	Acres	6,725
Problem 5 - Wilderness		
Wilderness designation and/or study acreage	Thousand acres	50.0

1/ All dollars are in 1978 terms.

Alternative 8

Purpose

To provide for a variety of vegetative conditions and recreation opportunities while providing moderate amounts of habitat for game and nongame species of wildlife.

Goals in Response to Management Problems

Problem 1 - Transportation

* Goal 5 - Provide for a moderate amount of local road construction with emphasis on low-standard roads. Provide for relatively large amounts of roaded natural and moderate amounts of semiprimitive motorized and semiprimitive nonmotorized recreation opportunities. Provide for low densities of road in semiprimitive areas.

  Goal 7 - Provide for the highest PNV possible, given the increased emphasis on aspen management, emphasis on spatial distribution, increased emphasis on uneven-aged management of hardwoods, intensive even-aged management, and increase in semiprimitive recreation opportunities.

Problems 2 and 4 - Wildlife and Vegetation

* Goal 1 - Maintain a moderate acreage of aspen type and thermal cover in areas of the Forest with the greatest potential for deer and grouse. Increase the long-rotation conifer component slightly. Manage swamp conifer and hemlock types at a very modest level. Provide for regeneration harvest of swamp conifer and hemlock types at or below the current rate. Provide for moderate to high amounts of aspen products for 5 decades.

* Goal 2 - Manage northern hardwoods with slight emphasis on uneven-aged management (56 percent of hardwoods managed for timber production). Emphasize uneven-aged management of hardwoods in areas of the Forest managed for semiprimitive recreation opportunities and where sugar maple dominates the climax vegetation. Maintain or increase diversity of tree species in the hardwood type through intensive even-aged silvicultural practices in areas of the Forest with the greatest potential to maintain mid-tolerant species and provide for improved wildlife habitat.

* Goal 3 - Emphasize aspen and conifer cover on high and medium wildlife opportunity areas.

  Goal 4 - Emphasize natural regeneration. Provide for a small amount of artificial reforestation and chemical use.

Goal 8 - Create a moderate to high amount of temporary opening with emphasis on clearcutting for aspen management.

Problem 5 - Wilderness

Goal 6 - Recommend Sturgeon Gorge and Sylvania for wilderness study. Recommend Norwich Plains and Cyrus H. McCormick Experimental Forest for nonwilderness.

Table 2.10
Significant Results/Benefits of Alternative 8

Results/Benefits	Units	Outputs/Conditions
Economic and Social Effects		
Present net value	Thousand dollars 1/	246,662
Average annual budget in first/fifth decade	Thousand dollars	3,904/4,522
Average annual returns to treasury in first/fifth decade	Thousand dollars	1,257/4,723
Average annual payments to counties in first/fifth decade	Thousand dollars	787/1,181
Average annual nonmarket priced benefits first/fifth decade	Thousand dollars	9,300/13,500
Average annual recreation use by ROS class over first 2 decades	Thousand RVDs	
Semiprimitive nonmotorized		41
Semiprimitive motorized		57
Roaded natural (Dispersed)		634
(Developed)		268
Wildlife-based recreation	Thousand RVDs	976
Fishing	Thousand RVDs	126
Problem 1 - Transportation		
Average miles of local road construction per year by standard (first 2 decades)	Miles	
Winter only		14
Winter dry/summer		10
Summer normal		10
Total		34
Acres by ROS class	Thousand acres	
Semiprimitive nonmotorized		154
Semiprimitive motorized		102
Roaded natural		670
Problems 2 and 4 -Wildlife and Vegetation		
Aspen acreage maintained	Thousand acres	129
Thermal cover acreage	Thousand acres	152
Even-aged hardwood management	Thousand acres	125
Uneven-aged hardwood management	Thousand acres	160
Average annual timber volume (first 2 decades)	Million cubic feet	
Aspen products		4.1
Hardwood sawtimber		1.7
Total timber		15.9

Table 2.10 (continued)

Results/Benefits	Units	Outputs/Condition
Average annual timber volume (first five decades)	Million cubic feet	
Aspen products		5.9
Hardwood sawtimber		3.5
Total timber		21.2
Average annual aspen regeneration by wildlife opportunity group (first 2 decades)	Acres	
High opportunity area		1,980
Medium opportunity area		860
Low opportunity area		390
Total		3,230
Average annual artificial reforestation reforestation (first 2 decades)	Acres	500
Average annual natural reforestation with site preparation (first 2 decades)	Acres	3,200
Average annual conifer release (first 2 decades)	Acres	150
Average annual conversion to spruce-red and white pine (first 2 decades)	Acres	200
Average annual clearcut acreage (first 2 decades)	Acres	4,450
Average annual total temporary opening (first 2 decades)	Acres	5,100
Problem 5 - Wilderness		
Wilderness designation and/or study acreage	Thousand acres	33.2

1/ All dollars are in 1978 terms.

Opportunity Analysis

No opportunity analyses were completed as part of alternatives. Several opportunity analyses were completed as part of benchmarks (BM 5, 10, 11, 12, 13, and 14). These benchmarks helped to reveal the sensitivity of the Forest to changes in certain assumptions. None of these benchmarks were later used as the sole basis for design of an alternative. However, the information obtained from these benchmarks provided a better understanding of the influence of certain resources or their management on other resource opportunities. A summary of important findings developed through the benchmark analysis are listed earlier in this chapter under the "Role of Benchmarks in Developing Alternatives." Detail on these benchmarks can be found in the Final EIS Appendix Volume, Appendix B, Part 6.

Selection of Land to Management Areas

The land and resource conditions described in Table 2.11 are called management areas. The distribution and location of management areas changes with each alternative. Management area selection was based on the mix of goods, services, uses, and conditions needed to achieve the objectives of each alternative. Management prescriptions are a mix of management practices that are designed to produce a desired forest condition when applied to specific areas of the Forest. An alternative may produce the same vegetative condition at several locations within the Forest. That is, a management area will usually not be one contiguous area, but occur in several locations across the Forest.

The suitability of land for a given management area depends on the capability of the land area along with the desired mix of goods, services, uses, and conditions needed to achieve the objectives of an alternative. The results of the selection are mapped for each alternative (See the map folder that accompanies this document.)

Table 2.11
Acreage Assigned to Management Prescriptions by Alternative

Management Area	Management Prescription	Alternative 1	2	3	4	5	6	7	8
		(thousand acres/percent of Forest)							
1.1	Emphasizes aspen vegetation in a motorized recreation environment. Provides habitat for deer, ruffed grouse, and other wildlife requiring young forests.	55 6%	73 8%	113 12%	27 3%	- -	63 7%	69 7%	12 1%
2.1	Emphasizes uneven-aged management of northern hardwoods to produce quality hardwood timber products and associated wildlife in a motorized recreation environment.	55 6%	55 6%	- -	- -	368 40%	299 32%	360 39%	313 34%
3.1	Emphasizes even-aged management of northern hardwoods, softwoods, and aspen vegetation in a motorized recreation environment. Provides habitat for deer, ruffed grouse, and other wildlife by establishing a variety of vegetation cover types and age classes.	32 3%	40 4%	48 5%	- -	- -	115 13%	56 6%	6 1%
3.2	Emphasizes even-aged management of northern hardwoods. Provides habitat for deer, ruffed grouse and other associated wildlife in a motorized recreation environment. Provides a forest scene with occasional temporary openings mixed with stands of larger and older trees.	386 42%	541 58%	492 53%	302 33%	- -	- -	141 15%	227 25%
4.1	Emphasizes even-aged management of long-lived conifers and associated wildlife habitat in a motorized recreation environment.	44 5%	100 11%	25 3%	45 5%	- -	57 6%	63 7%	63 7%
4.2	Emphasizes even-aged management of shortlived conifers while maintaining habitat for associated wildlife in a motorized recreation setting.	62 7%	4 -	37 4%	64 7%	- -	43 5%	14 1%	38 4%
5.1	Provides for management of Congressionally designated wilderness.	- -	- -	- -	- -	- -	- -	- -	- -
6.1	Emphasizes semiprimitive nonmotorized recreation and uneven-aged management of northern hardwoods and less frequent harvesting of other vegetative types. Provides habitat for wildlife requiring remoteness. Most roads will be closed.	44 5%	- -	66 7%	76 8%	55 6%	83 9%	61 7%	58 6%
6.2	Same as Management Area Prescription 6.1 except motorized recreation environment is emphasized and provides for some ORV use including snowmobiling and all-terrain-vehicle use.	109 12%	- -	48 5%	272 29%	57 6%	100 11%	51 5%	94 10%

Table 2.11 (continued)

Management Area	Management Prescription	Alternative 1	2	3	4	5	6	7	8
		(thousand acres/percent of Forest)							
7.1	Provides for high density self-contained motorized recreation environment in the management of the Black River Recreation Area.	4 -	4 -	4 -	4 -	4 -	4 -	1 -	4 -
8.1a	Provides for management of the Cyrus H. McCormick Experimental Forest for the conduct of research in a semiprimitive nonmotorized day-use only environment.	- -	14 2%	- -	- -	- -	- -	- -	- -
8.1b	Same as 8.1a except provides for overnight camping and snowmobile grooming of cross-country ski trails.	- -	- -	14 2%	- -	14 2%	14 2%	- -	14 2%
8.2	Provides for management of the Sylvania Recreation Area (perimeter zone) and the McCormick entrance area in motorized recreation development.	3 -	2 -	2 -	3 -	2 -	2 -	3 -	2 -
8.3	Provides for management of the Sylvania Recreation Area (interior zone) in a semiprimitive nonmotorized recreation environment.	- -	- -	18 2%	- -	- -	- -	- -	- -
8.4	Provides for management requiring protection of established and proposed research natural areas to preserve unique ecosystems for scientific purposes.	- -	4 -	4 -	- -	4 -	4 -	- -	4 -
9.1	Provides for minimum management requiring protection and maintenance of existing environmental values in designated wilderness study areas, candidate research natural areas and areas recommended for wilderness designation.	50 6%	37 4%	- -	58 7%	33 4%	18 2%	50 6%	33 4%
9.2	Provides for minimum management requiring protection and maintenance of existing environmental values of Wild/Scenic Inventory Study River corridors.	52 5%	52 5%	52 5%	52 5%	52 5%	52 5%	52 5%	52 5%
9.3	Provides for minimum management requiring protection and maintenance of environmental values and the health and safety of the public.	32 3%	1 -	7 1%	21 2%	341 37%	75 8%	6 1%	11 1%
	Total Acres	926.0	926.0	926.0	926.0	926.0	926.0	926.0	926.0

Comparison of Alternatives

This section is a summary of the major outputs, activities, uses, conditions, and effects of each alternative, including the preferred alternative. The outputs are displayed in a comparative format and provide further definition of the problems and alternative choices for resolving these problems. The following sections are included:

- Comparison based on the management problems.
- Comparison based on economic values.
- Comparison to RPA targets.
- Comparison of environmental consequences.

The differences shown in the alternative sets of activities and their cost, outputs and their benefits, and conditions and their effects must be considered carefully by the reader to draw a conclusion as to which alternative maximizes total net public benefits. No one alternative will provide the ideal amounts of all conditions or products. The Forest Service preferred alternative, generally speaking, exceeds some minimal level of supply of each condition or resource output and achieves some acceptable level of response to each problem. However, the preferred alternative selected by an individual may or may not achieve the optimal supply of any condition or resource. Key measurements (associated with goals) were used to compare the response of each alternative to management problems.

It must be kept in mind that all the available information must be used to derive the net public benefit of each alternative, not just items which have dollar value assigned to them. While some of the more quantifiable information may be considered in an objective manner, the nonquantifiable costs and benefits must be considered subjectively in the trade-off process, which ultimately defines the reader's ranking of alternatives in terms of net public benefit. For this reason, the practices shown in Chapter IV of this document, additional information contained in the Final EIS Appendix Volume, Appendix B, and the management area maps may help the reader in reaching a conclusion.

Comparison Based on Management Problems

Problem 1 - Transportation

The response of an alternative to the transportation problem was measured in terms of how much new local road construction would be required, what mix of road standards are planned, and what long-term mix of ROS classes would be provided. Goals 5 and 7 and their associated key measurements are designed to address and measure response to the transportation problem.

Goal Theme 5

Provide a local transportation system that provides a mix of road standards and density that is appropriate to manage for access, for a variety of recreational opportunities, and for transportation of timber in a timely manner, mix of ROS class, and threatened and endangered species habitat.

Discussion

An efficient transportation system must serve a set of needs. The miles of road in the system for an area of the Forest, the location of that road, and the standard of the road itself are all important determinants to the range of management objectives achievable.

The management objectives of an area help define an appropriate road system to serve it. The standard of road or mix of standard from winter-only road to summer-normal road influences the access to an area that a road system provides throughout the year. The least expensive standard very often provides the shortest access period. This period may conflict with other uses not dependent upon a road or be too short to provide for a full year of opportunities intended in some areas. Due to these types of features and a set of multiple use objectives across an area, a mix of standard, emphasizing one type of road or another, is usually optimal.

Roads constructed in an area must be built to complement a set of objectives for an area now and over time. The many objectives for an area and products desired from an area must be viewed collectively and over time rather than piecemeal. On this basis, alternatives involving few miles of road in its system that access many areas and allow many uses are favored over a system that results from building roads one at a time, one objective at a time. Systems must also be designed that are compatible with objectives highly tied to their presence or absence. Recreational opportunities unique to semiprimitive motorized or nonmotorized areas require a specialized road system. For these types of areas to work, vegetative management practices over time are few compared to a Forest average; the amount of timber volume is less; and roads as part of the landscape are minimized. Designation of these types of areas are positive steps to responding to recognized recreational and wildlife needs while simultaneously reducing roading requirements.

See Figure 2.2, ROS Classes by Alternative, and Figure 2.3, Miles of New Road Construction, for basic characteristics about alternatives, pertinent to this problem.

Key Measurement	Range of Possible Management Responses: Low Response	High Response
ROS Class	(thousand acres)	
Roaded natural	472 (Alt 4)	820 (Alt 2)
Semiprimitive motorized	0 (Alt 2)	272 (Alt 4)
Semiprimitive nonmotorized	106 (Alt 2)	182 (Alt 4)
Local road construction or reconstruction by standard (2-decade average)	(miles per year)	
Total	28 (Alt 3)	43 (Alt 6)
Winter-only	11	17
Winter/summer-dry	9	13
Summer-normal	8	13

Figure 2.2
ROS Classes by Alternative

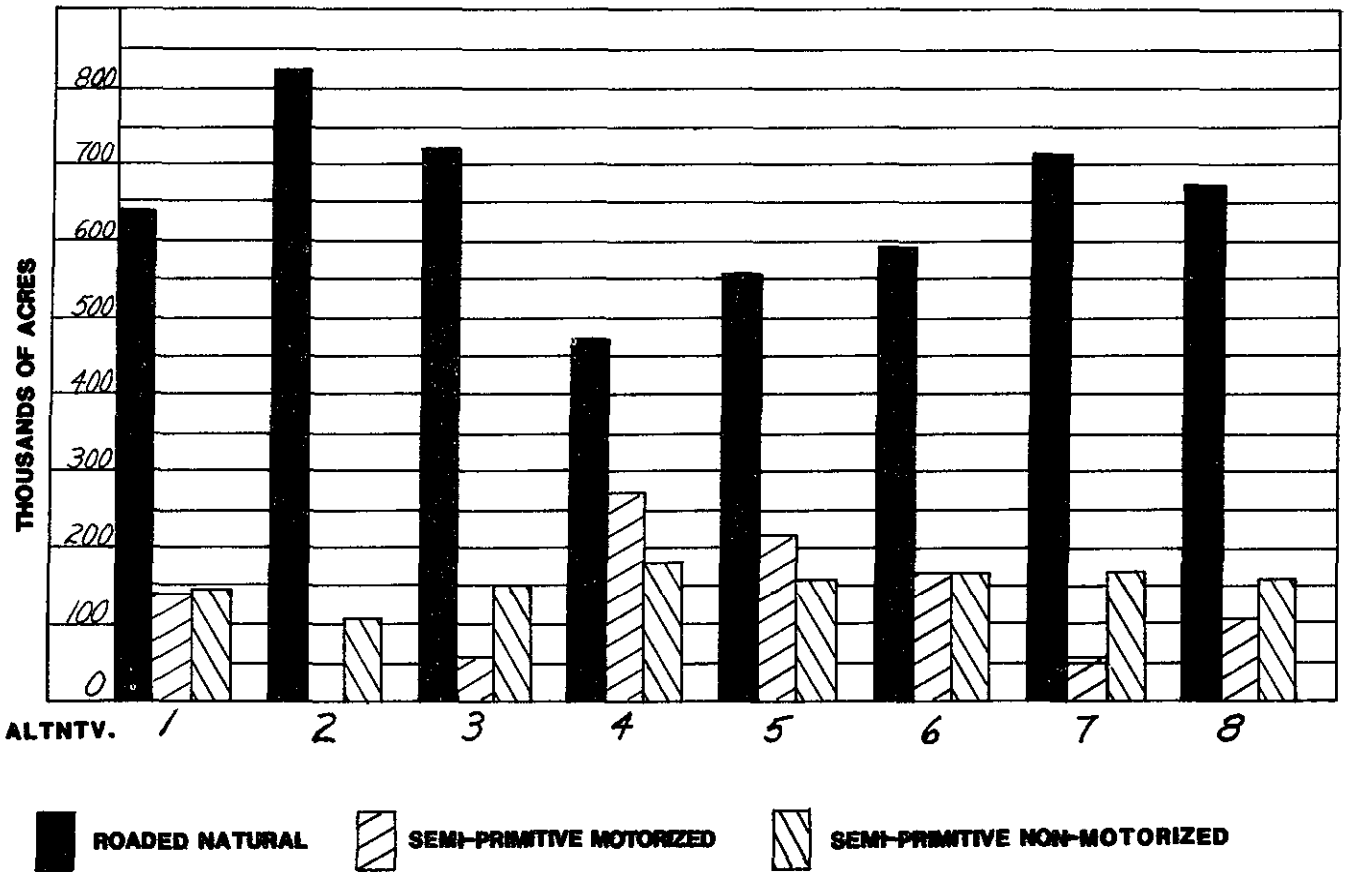


Figure 2.2 shows the distribution of Forest acres to ROS classes for each alternative.

Figure 2.3
Miles of New Road Construction

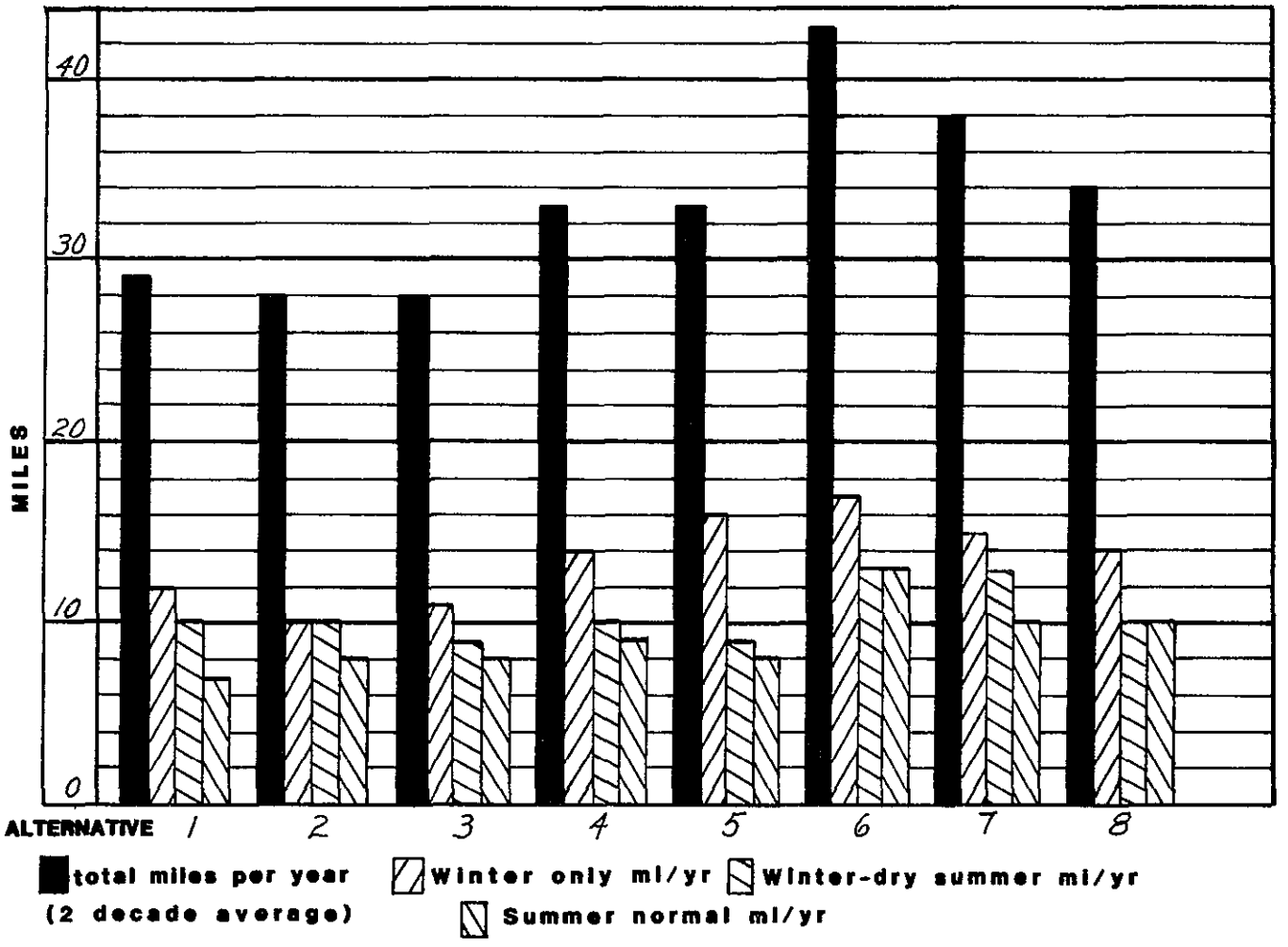


Figure 2.3 shows the total amount of new road construction or reconstruction by road standard on an average annual basis over the first 2 decades.

Figure 2.2 shows that there is significant variation between alternatives in ROS class acreages. Alternative 2 is predominantly roaded natural, whereas alternative 4 is relatively closely matched in the three classes.

In conjunction with miles of road and standard, this information can be used to define an alternative's responsiveness to various Forest uses. An alternative with higher amounts and standards of roaded added to the current system coupled with high amounts of roaded natural ROS class, would provide the greatest degree of accessibility for timber harvest and haul operations. Examples of alternatives fitting this criteria include alternatives 2, 3, and 7.

Alternatives with a greater mix of ROS classes, usually accompanied by lesser amounts of road construction would provide more diverse settings. This is more responsive to providing a range of recreational activities, including hunting. Alternatives that are responsive to these uses include 1, 5, 6, and 8.

Additional information about the effects alternatives have on road systems, access, and uses dependent or influenced by roads is presented in Chapter 4, Part C and D.

Goal Theme 7

Manage the forest in the most economically efficient manner.

Discussion

Each Forest Plan alternative can be measured in terms of cost efficiency by measuring the present net value (PNV). PNV is equal to the value of benefits over costs over 150 years of their production. It is expressed in terms of a base year, 1978. However, the alternative with the greatest PNV is not necessarily the most efficient. The most economically efficient alternative is that one that achieves the most of socially desired benefits with the lowest possible costs. Many of these benefits and costs are quantifiable and measurable in dollar terms, many are not. Alternative 1 has the highest PNV, but since many of the Forest's objectives and desired benefits, as well as costs, are not readily quantified or expressed in dollar terms, it may not be the alternative of highest net benefits to the public. This measure, PNV, becomes only one of many in assessing the desirability of Forest Plan alternatives.

See Figure 2.4, Present Net Value, for a comparison of PNV by alternatives.

Key Measurement	Range of Possible Management Responses: Low Response	High Response
	(million dollars)	
PNV (assigned values)	201 (Alt 5)	275 (Alt 1)

Figure 2.4
Present Net Value (PNV)

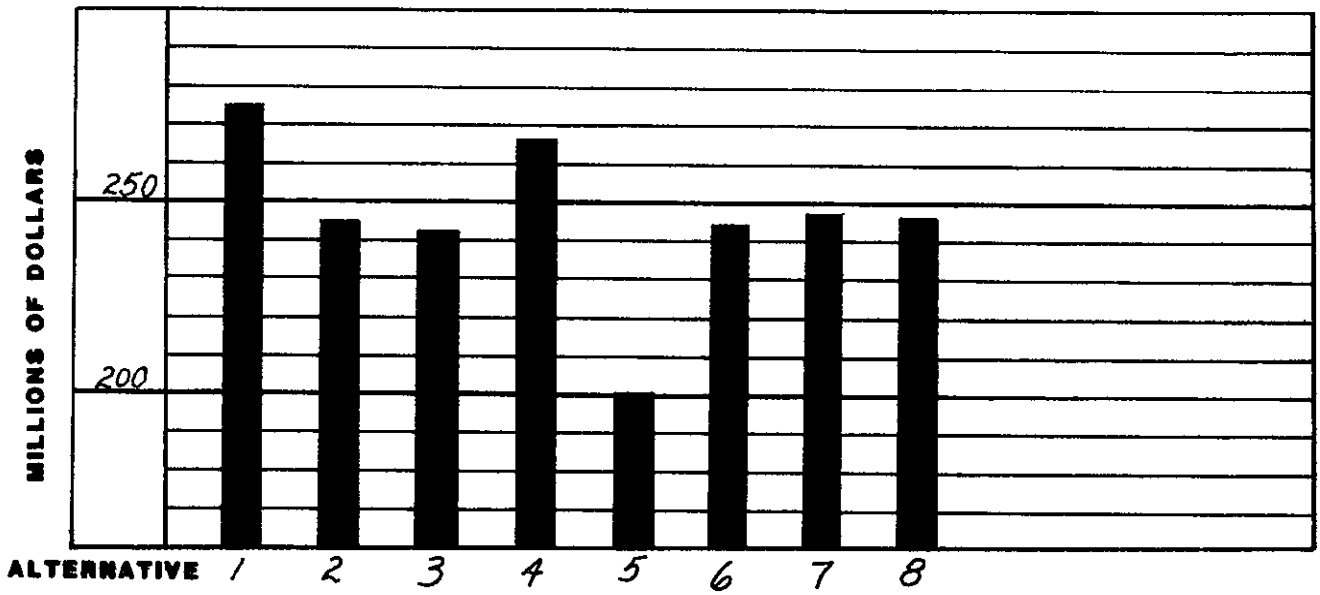


Figure 2.4 shows the total present net value of each alternative over 150 years time.

Figure 2.4 shows that most alternatives are relatively similar in terms of present net value (PNV) with the exception of alternative 5. Timber harvesting method restrictions imposed on the Forest analysis in alternative 5 drastically reduce the ability of many Forest acres to make a positive contribution to PNV. The remaining alternatives are similar because all are limited by demand on the production of forest products, including timber products, recreation uses, and hunting. Most alternatives could efficiently supply more production than permitted by demand for these products.

Problems 2 and 4 - Wildlife and Vegetation

The resolution of Problem 2 - Wildlife and Problem 4 - Vegetation Management are highly integrated. Both involve manipulation of forest vegetation. The scheduling of and location of vegetative treatments as well as objectives relating to control of age class distribution of vegetation and composition of vegetative types is critical to both of these problems. Because of this interrelationship, these two problems will be discussed together.

The response of an alternative to the wildlife problem was measured in terms of the number of deer and grouse and habitat provided, the acreage of aspen management, acreage of thermal cover, the mix of even-aged and uneven-aged hardwoods, the spatial distribution of aspen harvest, conversion to pine, ROS class mix, and acreage of temporary openings. Goals 1, 2, 3, 4, 5, and 8 and their associated key measurements are designed, in part, to respond to the wildlife problem.

The response of an alternative to the vegetation management problem was measured in terms of the amount of temporary opening, the amount and location of chemical use, species/product mix, and amount, and economic efficiency. Goals 1, 2, 4, 7 and 8 and their associated key measurements in aggregate are designed to address the vegetation management problem.

Goal Theme 1

Provide for a diverse range of vegetative composition through management of aspen, short-rotation conifers, and long-rotation conifers to provide a variety of recreation opportunities, visual variety, timber products, and wildlife habitats (deer and grouse).

Discussion

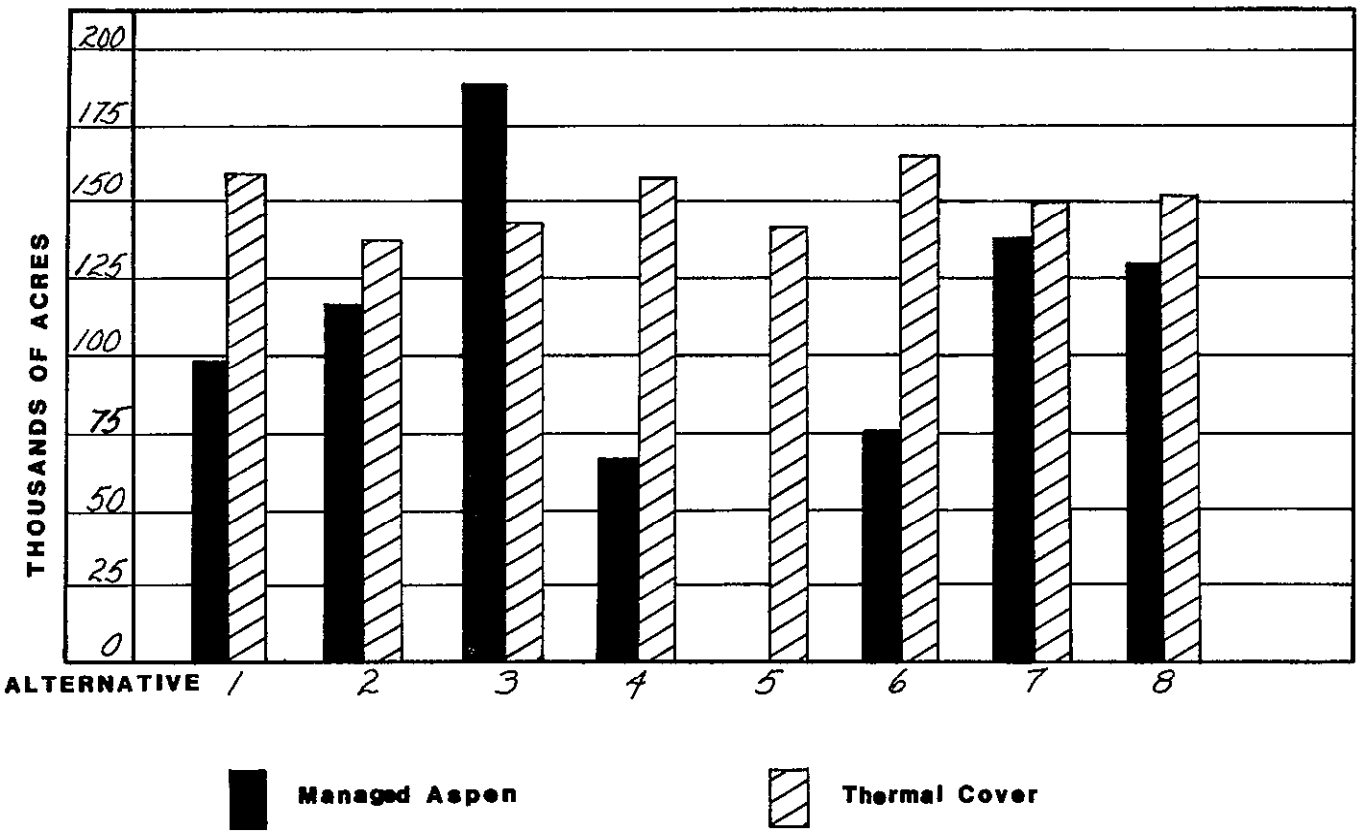
Wildlife habitat for many species including white-tailed deer and ruffed grouse is strongly influenced by the composition of vegetative types on the Forest. This is particularly true of young growth aspen as a source of forage and many conifer species as a source of thermal cover in winter. Management of these types helps ensure their presence through time while providing demanded and valuable timber products. Figure 2.5 displays acres of aspen and thermal cover for each alternative.

Increased acreages of these types will increase the availability of habitat which could lead to a greater and more constant number of animals through time. As a result, recreational opportunities would be both expanded and improved in quality.

Alternatives 3, 7, and 8 are relatively balanced in terms of aspen and thermal cover, an important criteria for assessing alternatives value for wildlife, particularly white-tailed deer. These alternatives would be most responsive to concern for these wildlife.

Key Measurement	Range of Possible Management Responses	
	Low Response	High Response
	(thousands of acres)	
Aspen type acreage maintained	0 (Alt 5)	186 (Alt 3)
Thermal cover acreage	137 (Alt 2)	164 (Alt 6)

Figure 2.5
Managed Aspen Acres and Acres of Thermal Cover 1/



1/ Thermal cover includes acres of hemlock, swamp conifer, and balsam fir-jack pine

Figure 2.5 shows acres of managed aspen and acres of thermal cover for each alternative at 150 years.

Goal Theme 2

Manage northern hardwoods to create a mixture of vegetative communities (species, structure, age class) that produce a variety of recreation settings, visual variety, timber products, and wildlife habitats over the planning horizon.

Discussion

The methods used to manage hardwood acres influence the quantities of hardwood products available for removal as well as their quality. Each system provides unique vegetative communities and associated wildlife habitat. For example, the uneven-aged system managed on a portion of the Forest would provide a continuous, unbroken forest canopy with little visual impact. It would produce a variety of shade-tolerant species such as sugar maple and contain trees of many different size classes. Generally, timber is removed from this type of stand condition once every 10 to 20 years. This is done by selecting individual trees for removal while maintaining a desired number of each size of other trees. Generally, long-term application of this system would result in a highly consistent flow of higher quality sugar maple sawtimber.

Even-aged management of hardwoods maintains stands of differing ages of trees from young growth to very old growth and provide a greater diversity of species within each stand. Under the even-aged system, each stand would be periodically thinned (every 10 to 20 years), leaving the remaining trees to grow until the stand reaches an older condition at which time the stand is regenerated. Over time, a forest managed under this system would provide a variety of mixed hardwood stands of different ages. This should result in somewhat equal acreage of stands ranging from young growth conditions to older growth conditions that could be perpetuated.

Since both systems provide different but often desirable vegetative conditions, visual impacts, and wildlife habitats, a mix of the two systems would produce a range of desirable benefits. In addition, one system may be more appropriate than the other on a given site due to inherent site conditions and/or because it may better satisfy or integrate with other management objectives than simply timber production.

Figure 2.6 displays the composition of even-aged and uneven-aged managed hardwoods as part of each alternative in terms of acres and percent of total hardwood acres managed under each system. This mix, in conjunction with acres devoted to aspen and thermal cover management, has a significant impact on the allowable sale quantity as well as the mix of species/product groups such as hardwood sawtimber and aspen. Total volume and volume by aspen and hardwood sawtimber is displayed in Figure 2.7.

Alternatives 1, 2, and 3 are dominated by even-aged management in hardwoods. Alternative 5 is 100 percent uneven-aged management of hardwoods. Other alternatives have a relative balance of the two management systems. Generally speaking, alternatives favoring more uneven-aged management of hardwoods will produce more high quality sugar maple sawtimber, while even-aged management favors a greater mix of timber species and products.

Key Measurement	Range of Possible Management Responses: Low Response	Range of Possible Management Responses: High Response
	(thousand acres)	
Even-aged hardwood management	0 (Alt 5)	289 (Alt 1)
Uneven-aged hardwood management	30 (Alt 3)	202 (Alt 5)
	(thousand cubic feet per year)	
Average annual timber production (first 2 decades)		
Aspen products	700 (Alt 5)	4,600 (Alt 3)
Hardwood sawtimber	900 (Alt 5)	2,900 (Alt 1)
Total timber	7,000 (Alt 5)	16,000 (Alt 1, 4 & 7)
Average annual timber production (first 5 decades)		
Aspen products	300 (Alt 5)	6,200 (Alt 3)
Hardwood sawtimber	3,000 (Alt 3)	4,100 (Alt 1)
Total timber	8,700 (Alt 5)	21,900 (Alt 1)

Figure 2.6
Composition of Even-aged and Uneven-aged Managed Hardwoods

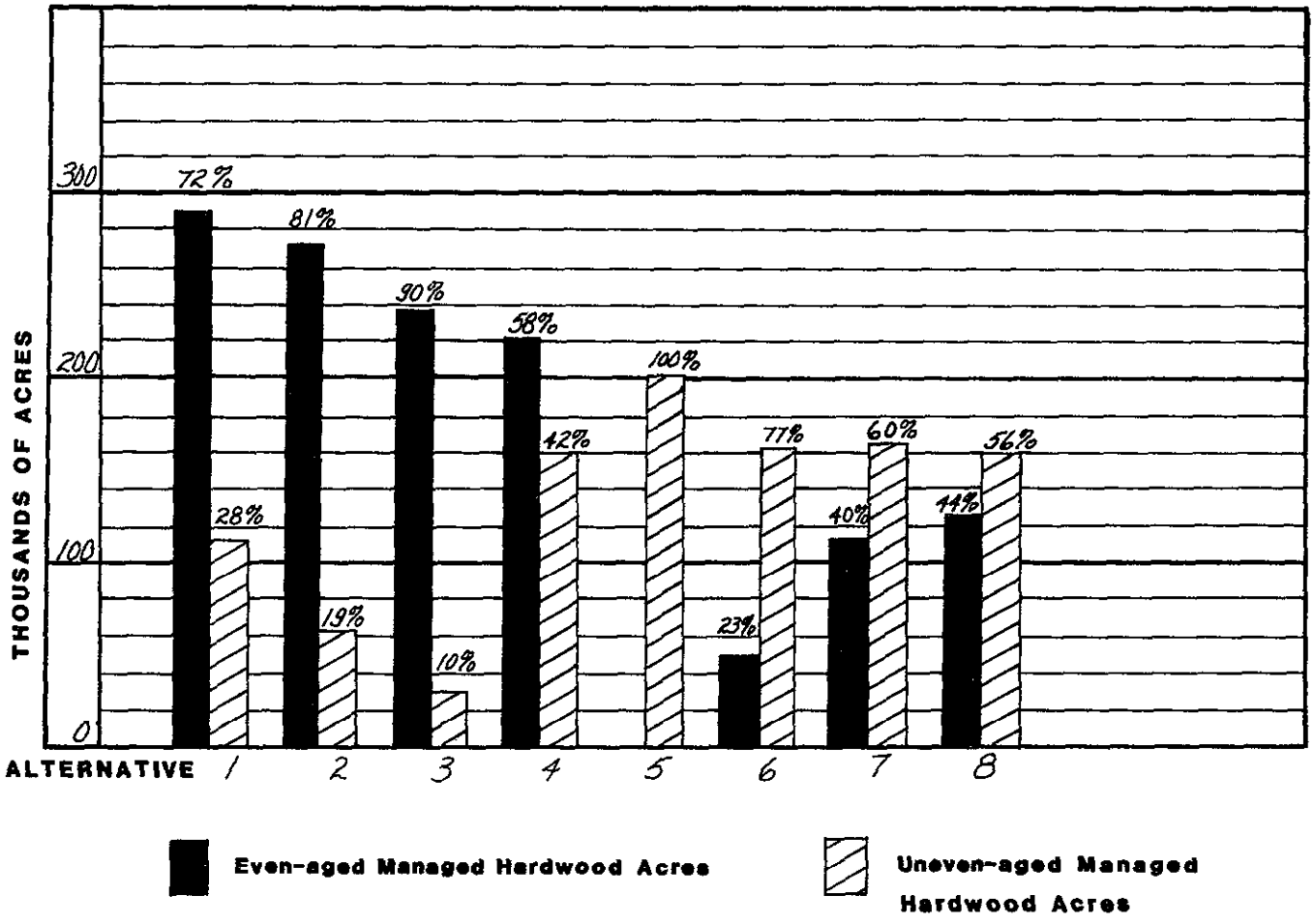


Figure 2.6 displays the total of long-term hardwood acres managed even-aged and uneven-aged, as well as a percent of the hardwood type.

Figure 2.7
Timber Volume to be Removed

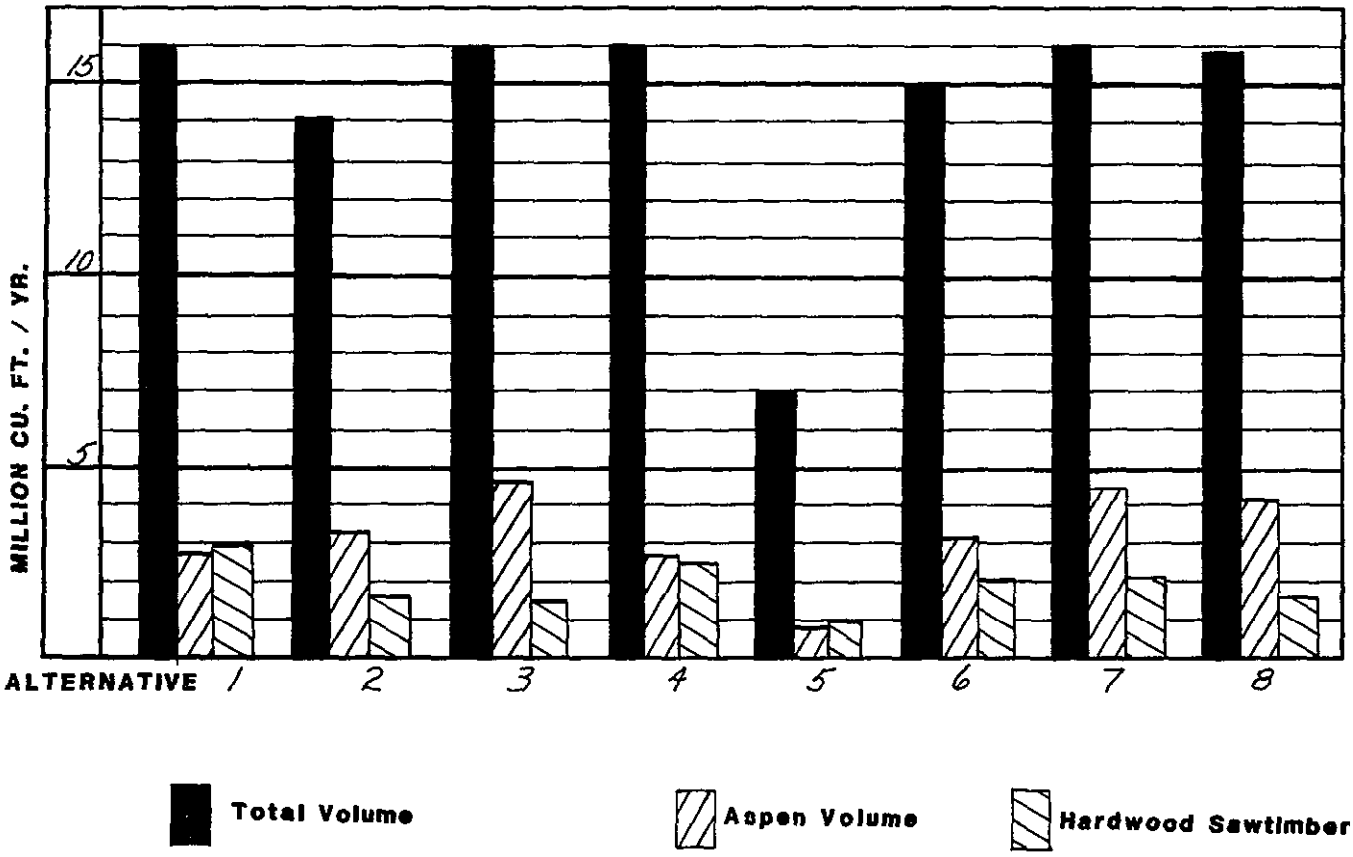


Figure 2.7 displays average allowable sale quantity over the first 2 decades by total volume, aspen volume, and hardwood sawtimber volume.

Goal Theme 3

Distribute and schedule vegetative management practices to provide a steady flow of timber to markets and improve wildlife habitat where benefits are greatest.

Discussion

The location of vegetative management practices has much to do with the overall benefits that can be produced from management of the Forest. The scheduling of these practices, by season and over time, influences the Forest's ability to provide benefits in a sustained way. Coordinating sets of practices within an area provides benefits far greater than singular isolated efforts.

Benefits include beneficial wildlife conditions, efficient road systems, and ensuring consistent consideration and response to concerns or opportunities within the area.

Identified areas of the Forest (wildlife opportunity areas) reflect the various levels of effects that practices such as clearcuts and other regeneration harvest cuts can have on wildlife habitat and wildlife-based recreation uses. Other delineations of the Forest reflect the various levels of demand that exist for timber products. Overall, those alternatives emphasizing practices on the areas of higher opportunity for these benefits would be favored for these features.

Key Measurements	Range of Possible Management Responses	
	Low Response	High Response
	(thousand acres)	
Average annual aspen regeneration by wildlife opportunity area		
High opportunity area (equal to 53% of Forest)	0 (Alt 5)	3,350 (Alt 3)
Medium opportunity area (equal to 25% of Forest)	0 (Alt 2,4 & 5)	1,470 (Alt 3)
Low opportunity area (equal to 22% of Forest	0 (Alt 4 & 5)	530 (Alt 3)

The chart above references three categories of Forest land called wildlife opportunity areas, rated for their wildlife habitat and wildlife-based recreation potential. The acres of aspen regeneration in each alternative, an important contributor to wildlife benefits, were estimated for the Forest as a unit and for each of the three areas. In a general sense, the greater the amount of aspen regeneration and browse conditions created in aspen clearcuts in areas of greatest opportunity, the more responsive an alternative is to game habitat and wildlife-based recreation. Figure 2.8 displays the amounts of aspen regeneration over the first 2 decades by opportunity area. Alternative 3 far outreaches other alternatives. Alternatives 7 and 8 also make important contributions to these concerns.

Figure 2.8
Aspen Regeneration by Wildlife Opportunity Area

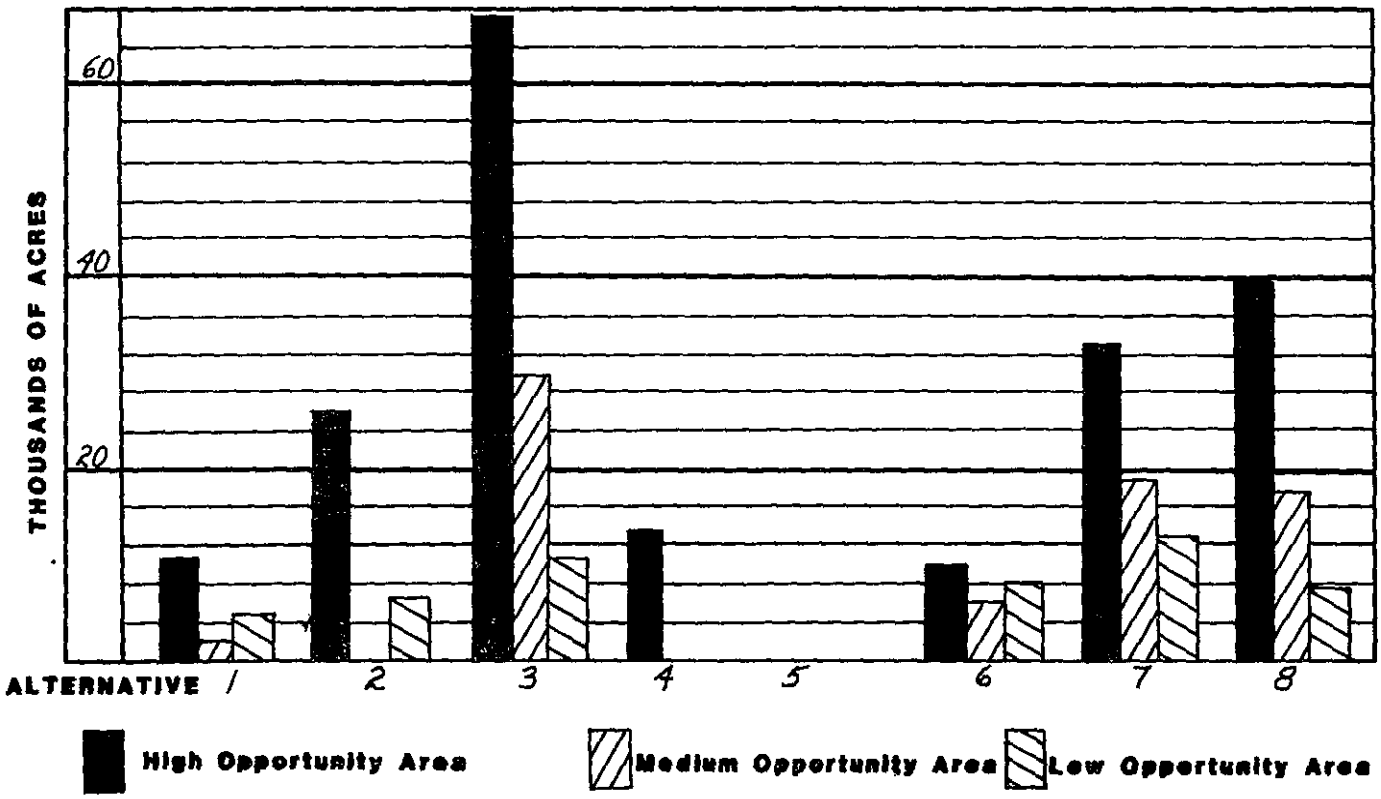


Figure 2.8 shows the acres of aspen regeneration over the first 2 decades by wildlife opportunity area.

Goal Theme 4

Carry out reforestation activities with emphasis on natural regeneration with prudent use of chemicals.

Discussion

Reforestation activities are designed to ensure a continuous acreage of healthy growing stock of desirable tree species. Many species can be regenerated after harvest by cultivating very young growth that grows under the forest canopy before its harvest. To obtain some species, it is necessary to physically bring them to the site for planting - artificial reforestation. Artificial reforestation on the Forest normally involves efforts to establish conifer species such as spruce and red and white pine. These activities are frequently costly and involve the use of chemicals or other intensive treatments to prepare the site and maintain good growing conditions for the seedlings through time. However, these efforts can add to the diversity of

vegetation types across the Forest and increased availability of softwood sawtimber products. Also, a certain number of sites exists on the Forest where reforestation activity for establishing spruce, red or white pine can take advantage of unique growing conditions for these species that complement other objectives in these areas. The range of reforestation activities among alternatives is displayed below.

Key Measurement	Range of Possible Management Responses	
	Low Response	High Response
	(average annual acres)	
Artificial reforestation (first 2 decades)	0 (Alt 3 & 5)	600 (Alt 2 & 6)
Natural reforestation with site preparation (first 2 decades)	0 (Alt 5)	4,700 (Alt 3)
Conifer release (first 2 decades)	0 (Alt 1, 3, 4 & 5)	700 (Alt 6)
Conversion to spruce-red and white pine (first 2 decades)	0 (Alt 1, 3, 4 & 5)	550 (Alt 2)

Figure 2.9 displays the average annual reforestation acres by alternative over the first two decades. Alternative 5 has no reforestation activities as no final harvest cuts are permitted. This alternative is most responsive to the concern for chemical uses on the Forest. However, alternatives with the most artificial reforestation and conversion to pine as shown on Figure 2.9 provide for higher levels of conifer timber products in the future. All alternatives are equal to or less than current levels of artificial reforestation on the Forest.

Conversion to pine and conifer release are two management activities highly, but not totally, dependent upon chemical uses. Figure 2.10 displays average annual acres of conversion to pine and conifer release for each alternative over the first 2 decades. Conversion to pine most frequently involves artificial reforestation and accounts for most of the acres shown in Figure 2.9.

Figure 2.9
Forestwide Reforestation

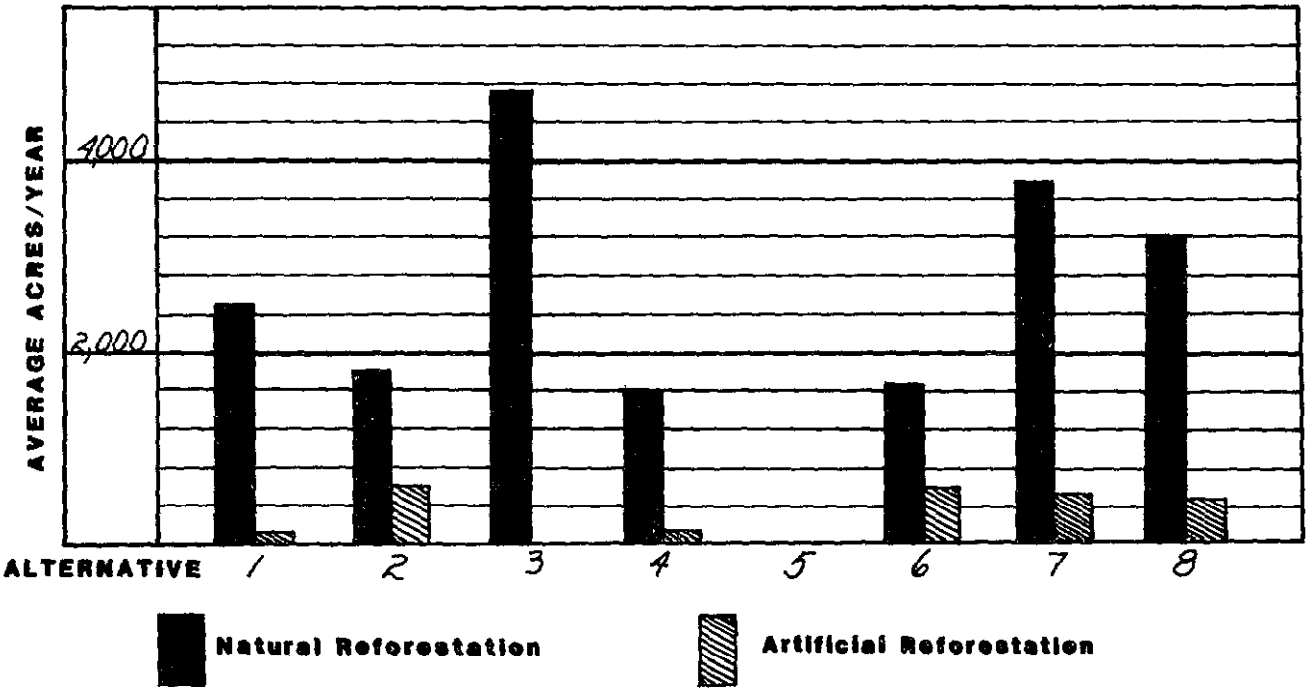


Figure 2.9 displays the average annual reforestation acres by artificial and natural methods over the first 2 decades.

Figure 2.10
Conversion to Pine and Conifer Release

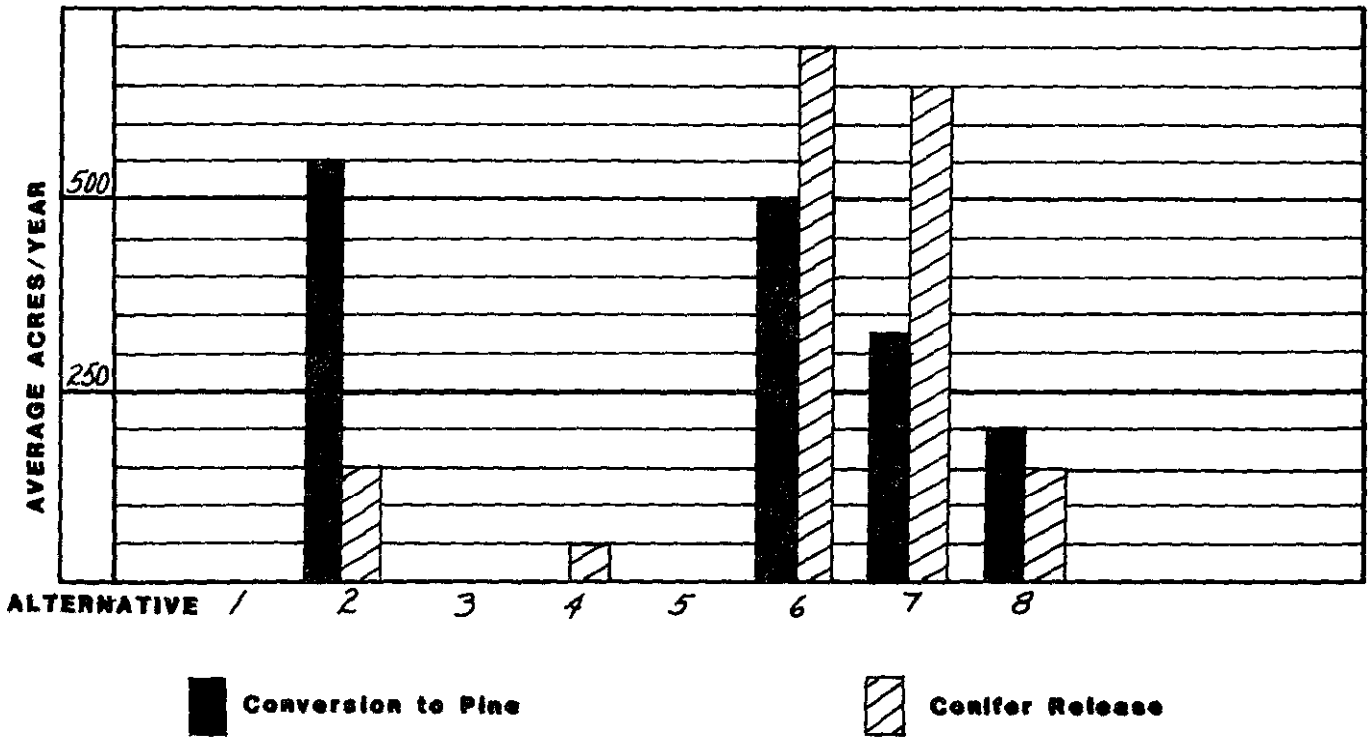


Figure 2.10 displays the average annual acres of acreage conversion to pine and acres of release in pine over the first 2 decades.

Goal 5 and Goal 7

The results of Goals 5 and 7 are displayed earlier in the discussion of Management Problem 1.

Goal Theme 8

Manage temporary openings appropriate to achieve integrated resource management objectives.

Discussion

The temporary openings associated with Goal 8 produce a conflict of both benefits and costs, both of which are important to assessing the responsiveness of each alternative to public issues and management concerns.

Temporary openings are an outcome of even-aged vegetation management. Even-aged management is the optimum method to retain certain vegetative types, including intolerant through mid-tolerant species. Refer to Forest Plan Appendix C, Harvest Cutting Methods. Even-aged management harvest, when applied to a proportion of suitable acres in each time period, provides a distribution of age classes, young to old, and the vegetative conditions unique to each.

This age-class distribution, when provided on a sustained basis, provides necessary habitat for many wildlife species, enhances wildlife-based recreation, and enables a continuous flow of timber products. One may also argue that temporary openings scattered through the landscape provide desirable visual quality. However, without due consideration to the amount of opening within an area, the proximity of the area with respect to other uses, the objectives of the area, and the design of the openings themselves, significant visual costs can result.

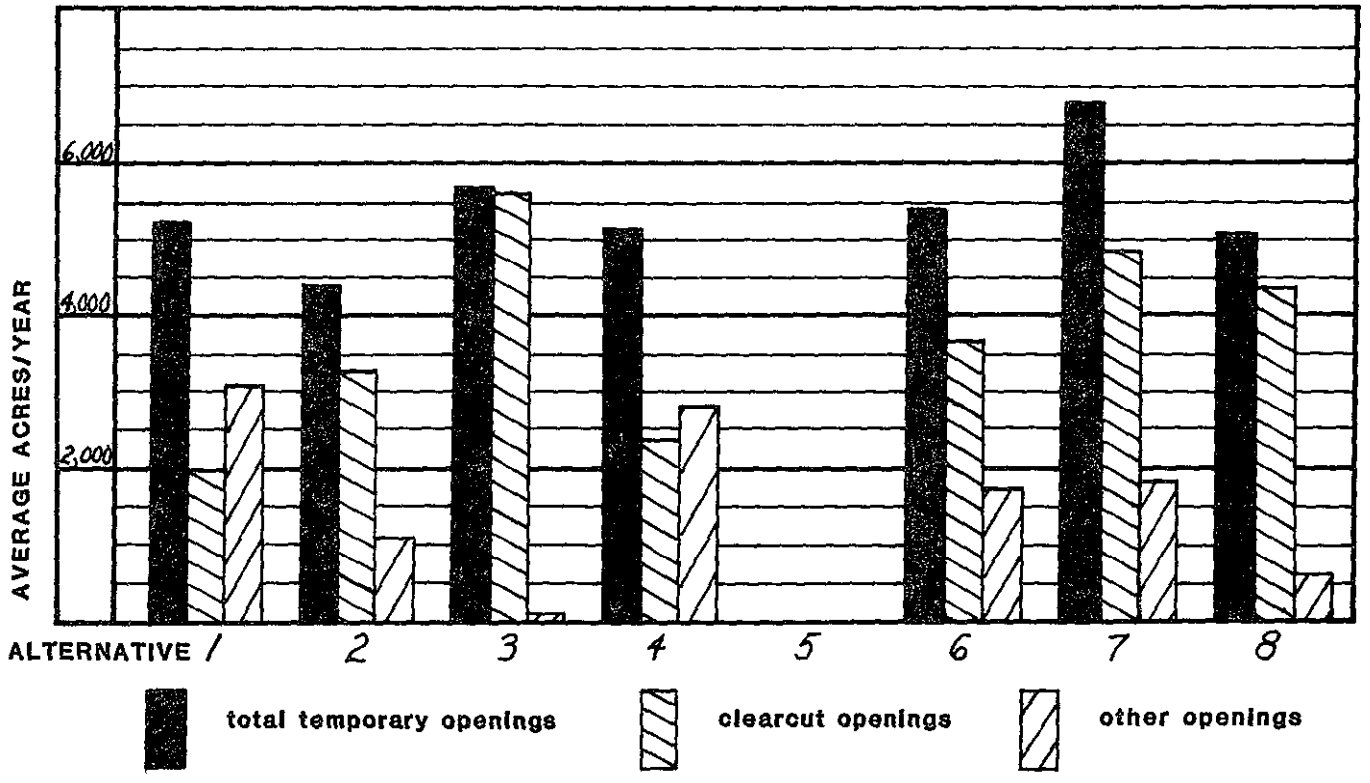
Mitigation measures have been designed to counter these negative impacts including design criteria for temporary openings in the Forestwide standards and guidelines and visual quality objectives for each management area. (See Forest Plan, Chapter IV). Also, certain management area prescriptions such as 6.1 and 6.2 call for a greater proportion of uneven-aged management as compared to other prescriptions and the even-aged harvest of timber only when it has reached greater age. This ensures few acres of openings and less frequent presence of woods operations, both important to the particular setting and visual quality characteristic of these prescriptions.

As a result, temporary openings either make or are associated with important benefits the Forest can provide in the short and long term to Forest users. The chart below displays key measures important to temporary openings concerns.

Key Measurement	Range of Possible Management Responses: Low Response	High Response
	(average annual acres)	
Temporary openings (first 2 decades)		
Clearcut	0 (Alt 5)	5,740 (Alt 3)
Other regeneration harvests (seedcuts, removal cuts)	0 (Alt 5)	3,150 (Alt 1)
Total	0 (Alt 5)	6,775 (Alt 7)

Temporary openings include openings created through clearcut and shelterwood seedcut operations (other openings). Figure 2.11 displays average annual acres over the first 2 decades. Alternatives 1, 3, 4, 7, and 8 form a group with high amounts of temporary openings, which help to ensure a distribution of age classes of stands providing a greater diversity of conditions for wildlife species. Alternatives 2 and 6 call for moderate amounts of openings. Alternative 5, for reasons previously stated, has no temporary openings whatsoever, severely restricting the diversity of vegetative conditions on the Forest. Generally speaking, those alternatives with the fewest temporary openings would have the least impact on the level of visual quality the Forest offers. See Final EIS Chapter IV, Part D for a more thorough discussion of the impact of temporary openings on wildlife habitat and visual quality.

Figure 2.11
Temporary Openings



A large number of factors or measures can be assessed to estimate the impact of alternatives on management problems 2 and 4, wildlife and vegetation management. Because of the many management activities involved and the variety of uses generated, no one alternative will completely satisfy all elements of the problem.

Problem 5 - Wilderness

The response of an alternative to the wilderness problem was measured in terms of the amount and location of recommended wilderness. Goal 6 and the associated key measurement were designed to address the wilderness problem.

Goal Theme 6

Provide for wilderness designation and/or study.

Discussion

Wilderness designation helps to provide a full range of recreational opportunities. It can also contribute to a full range of habitat conditions for wildlife species, particularly those requiring large remote areas such as the gray wolf. This environment also provides vegetation important to species dependent upon older mature stands or large areas of subclimax or climax vegetation. Not all areas have the same ability to provide the necessary conditions for designation, requiring careful consideration of all the attributes of candidate areas. Wilderness designation may help to satisfy demands for the recreational experiences they would offer. This could expand the number of users, the expenditures they make, and the contribution these candidate areas make to the local economy. This in part is due to the special status offered these areas by the designation label itself. Particular consideration should be given to these areas as they are in great part unique resources, and a long period of time would be required to reverse some of the impacts if these areas were managed for timber production. These areas may have some potential for other uses including timber volume production now, but reversing that decision and impacts later becomes extremely difficult. However, designation of these areas effectively removes them from the volume-producing base of the Forest and reduces the long-term sustained yield capacity of timber the Forest could ensure. Finding the highest utility for these acres requires careful consideration of the various resources they could supply in light of estimated demands for those resources as well as other costs and benefits. The chart below shows the range of response among alternatives to wilderness.

Key Measurement	Range of Possible Management Responses	
	Low Response	High Response
	(thousand acres)	
Recommended wilderness/ wilderness study acres	0 (Alt 3)	58 (Alt 4)

Figure 2.12 displays the amounts of acres by alternative recommended for wilderness designation or study. These acreages should be examined as single factors as well as the contribution they make to the diversity of recreation settings and activities the Forest can offer.

Figure 2.12
Recommended Wilderness Designation and/or Study

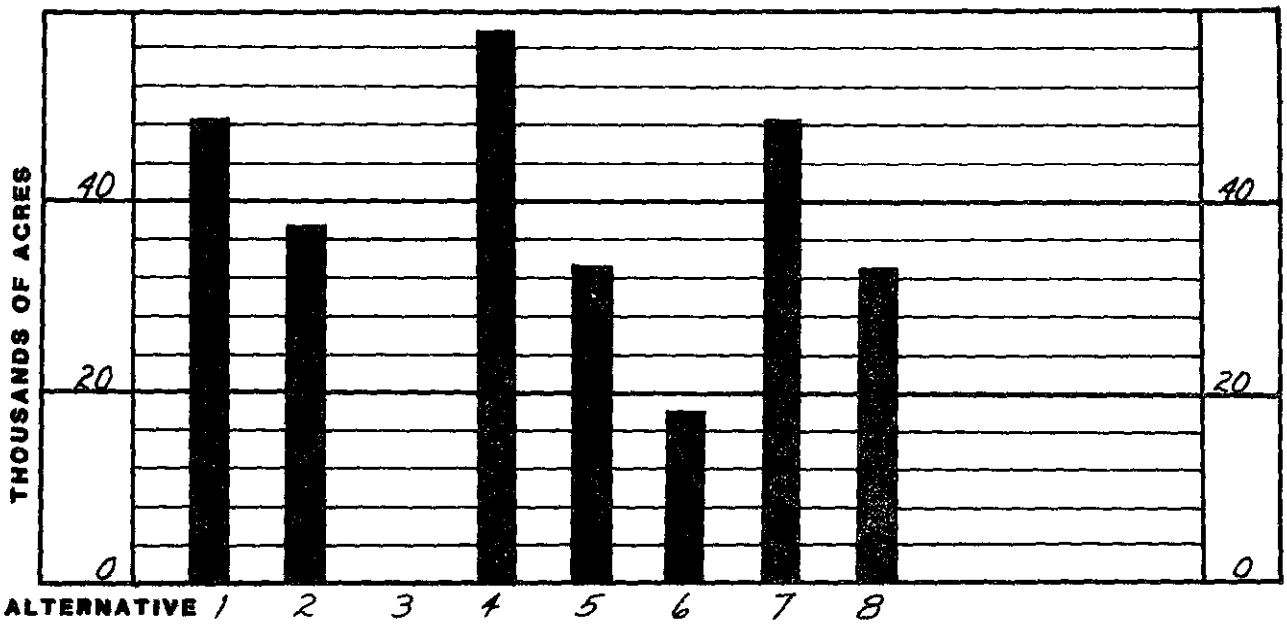


Figure 2.12 displays thousands of acres of wilderness designation and/or study by alternative.

Comparison Based on Economic Values

Present net value (PNV) estimates the potential economic effectiveness of management of the land and water resources of the Forest. It is an extremely important measure of the economic value of the Forest. It is one component or partial measure of net public benefits. It is calculated by subtracting budget costs from the economic or priced benefits that would be produced under an alternative, after both costs and benefits are appropriately discounted to the present.

The Final EIS Appendix Volume, Appendix B, Part 4 contains a detailed discussion of "net public benefits" and "present net value." PNV measures the net economic value of outputs for which dollar values are calculated. Economic costs and benefits and net economic and cash values are important components of net public benefits. The criterion used to evaluate each of the alternatives includes economic values as well as benefits

provided in response to management problems, as described previously in this chapter.

Differences in Present Net Value

The alternatives are ranked by decreasing PNV in Table 2.12. The Max. PNV benchmark is provided as a reference point; this benchmark is not a viable alternative because it was not designed to respond to the public issues. Information shown in parentheses represents the changes between successive alternatives.

As PNV decreases across alternatives, so do the discounted economic benefits. The greatest drop in PNV and discounted benefits occurs in alternative 5. Alternative 5 also had the lowest PNV, discounted benefits, and discounted cost of the eight alternatives considered.

In all of the alternatives, the discounted benefits is over three times greater than discounted cost.

With the exception of alternative 5, discounted cost varied less than 3 percent among the alternatives.

With the exception of alternative 5, discounted benefits and PNV varied up to 12 percent among the alternatives. Therefore, it can be concluded that the benefits produced have a greater impact on PNV than does the cost.

Table 2.12
Present Net Value and Discounted Cost and Benefits of Alternatives in Order of Decreasing Present Net Value

Alternative/Benchmark1/	Present Net Value	Change Between Alt.	Discounted Cost	Change Between Alt.	Discounted Benefits	Change Between Alt.
	(million dollars in 1978 terms)					
Max PNV Benchmark	281		104		385	
		(- 6)		(+ 2)		(- 4)
Alt. 1	275		106		381	
		(- 8)		(0)		(- 8)
Alt. 4	267		106		373	
		(-19)		(+ 6)		(-13)
Alt. 7	248		112		360	
		(- 1)		(0)		(- 4)
Alt. 8	247		109		356	
		(- 3)		(- 1)		(- 4)
Alt. 6	244		108		352	
		(0)		(- 1)		(- 2)
Alt. 2	244		107		350	
		(- 2)		(+ 1)		(0)
Alt. 3	242		108		350	
		(-41)		(-19)		(-60)
Alt. 5	201		89		290	

1/ Alternatives are ranked in order of decreasing PNV. Information shown in ( ) represents the change from the benchmark or alternative with the next highest PNV.

Differences in Benefits and Cost

Table 2.13 shows the variations in discounted benefits by resource benefit and discounted cost by major cost categories. Cost variations occur in recreation, vegetation management, and local road construction. The cost of vegetation management and local road construction is highly correlated with total timber harvest volume. Since total timber supply generally exceeds demand and it was economically efficient to produce a high level of timber products, all alternatives were demand-limited, resulting in a very similar level of total timber harvest volume. This also resulted in similar vegetative management and local road cost.

Also, with the exception of alternative 5, which was limited to uneven-aged management harvest, and alternative 2 (current direction), which was limited to current budget levels, all of the alternatives were limited by demand for fishing RVDs, dispersed and developed recreation as well as timber in one or more decades.

Since priced benefits are valued only up to the amount expected to be consumed, all alternatives that meet demands provide similar discounted benefits.

The total reduction in discounted cost in alternative 5 is due primarily to the reduced amount and cost of vegetative management. This reduced cost however, also results in a reduction in benefits that is three times greater than the reduction in cost.

On this Forest, capital investments are made for road construction and reconstruction, bridge and dam reconstruction, recreation reconstruction, facility reconstruction and landline location. All other costs are considered operation and maintenance.

Approximately 52 percent of the Forest budget was considered fixed. The other 48 percent of all cost varies with the objectives of specific alternatives. Refer to Final EIS Appendix Volume, Appendix B, Part 3 and 4 for more detailed cost information, and Chapter IV of this document for more detailed information on variations in Forest budget cost items by alternative.

The total annual first decade budgets for all alternatives are similar to the average 1980 to 1984 expenditure level of $3,888,000 (in 1978 dollar terms).

Five of the alternatives (1, 2, 3, 4, and 5) require budgets lower than the current level, with alternative 5 requiring the lowest budget with a reduction of 10 percent from the current level.

Three alternatives (6, 7, 8) require budgets higher than the current level, with alternative 7 requiring the highest budget with an increase of 7 percent over the current level.

In general, alternatives with the highest level of road cost also had the highest total budget. However, although alternative 5 had the lowest budget requirement, the cost for road construction was nearly at current levels. Cost reduction in alternative 5 is due primarily to the reduction in vegetation management.

Variations in total discounted benefits occur primarily due to variations in recreation and timber benefits. Variations in recreation benefits can be attributed primarily to the acreage of recommended wilderness designation and/or study included in an alternative. Since capacity for dispersed roaded natural recreation opportunities is generally in excess of the level demanded, additional acreage of roaded natural ROS class contributes very little additional recreation benefit values. However, additional acreage of semiprimitive motorized or semiprimitive nonmotorized (including wilderness) generally adds additional recreation benefit value to an alternative.

Alternatives that include wilderness designation and/or study recommendations add recreation benefit values because they help to satisfy demand for semiprimitive recreation opportunities and are assigned a higher dollar value than other dispersed recreation RVDs. (See Final EIS Appendix Volume, Appendix B, Part 4, page B4-18.)

Variations in discounted benefit values for timber, as shown in Table 2.13, can be attributed primarily to the species/product mix produced and the management system emphasized, rather than the total volume of timber production. Generally, alternatives that emphasize higher valued hardwood sawtimber and conifer products and that emphasize even-aged management result in higher discounted timber benefits. Alternatives that emphasize aspen products produce lower timber benefit values, due to the lower value of those products.

With the exception of alternative 5, wildlife and fisheries benefits show no significant variation by alternative because the level of RVD capacity provided generally meets or exceeds the estimated Forestwide demand.

Direct comparisons of benefits and cost by individual resource or cost category should not be made since the resource benefits produced cannot be directly attributable to a single cost category.

For example, the recreation, wildlife, and fisheries benefits produced require investments in the cost categories of vegetative management, local road construction, road maintenance, bridges and facilities as well as in recreation and fisheries. Timber benefits also require investments in cost categories of local road construction, road maintenance, bridges, and landlines as well as in vegetation management.

Table 2.13
Present Net Value and Discounted Benefits and Cost by Resource Groups 1/

(Alternatives are ranked in order of decreasing present net value.)

	Alt. 1	Alt. 4	Alt. 7	Alt. 8	Alt. 6	Alt. 2	Alt. 3	Alt. 5
	(million dollars in 1978 terms)							
Present Net Value	275	267	248	247	244	244	242	201
Discounted Benefits 2/								
Recreation	175	171	172	170	165	160	167	138
Wildlife	53	53	53	53	53	53	53	50
Fisheries	61	61	61	61	61	60	61	61
Timber	90	86	72	70	70	75	67	39
Other 3/	2	2	2	2	2	2	2	2
Discounted Cost 2/								
Recreation	8.5	9.0	10.6	10.5	9.0	10.0	9.0	10.5
Vegetation management	39	38	38.5	38	38	36	38	20
Local road construction	7.5	8.0	9.6	9.5	10.0	9.0	9.0	7.5
Road maintenance, bridges, dams and facilities	14	14	16.3	14	14	14	14	14
Lands and landlines	8	8	8	8	8	8	8	8
Fisheries	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
General administration	23.5	23.5	23.5	23.5	23.5	23.5	23.5	23.5
Other	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0

1/ Direct comparisons of benefits and cost by individual resource should not be made because they will be misleading because individual cost categories generally provide a variety of benefit values and are nonseparable under multiple-use management.

2/ Benefits include induced and uninduced benefits. Cost includes minimum level cost. For a better understanding of induced benefits, one should consider the marginal benefits and cost compared to the minimum level benchmark.

3/ Includes minerals, soil, water, and air administration costs.

Vegetative management costs include preparation and administration of timber sales, planning and inventory, reforestation, timber stand improvement, and wildlife management and produce many benefits in addition to current timber revenues.

Wildlife habitat and vegetative diversity (cover types and age classes) are improved primarily through vegetation management accomplished through commercial timber sales. Recreation and visual resource values are also increased through management of the vegetation in a manner that works toward and maintains desired vegetative conditions, while at the same time producing timber products.

Vegetation management costs in conjunction with costs for road construction and maintenance, recreation, lands and landline location, produce a wide range of benefits available from the Forest over a long period of time. Costs such as road construction, landline location and cultural resource surveys are one-time capital investments that contribute to producing benefits for many years into the future. However, these costs have historically been charged against a single timber sale.

Forest management also involves a variety of long-term investments in vegetation management such as reforestation, timber stand improvement, and, to some degree, commercial thinnings. These costs have also been charged against the cost of timber sales.

However, these costs should not all be viewed as charged completely against a current timber sale or an annual program of sales. This is because they produce many future benefits in terms of timber revenues and a variety of nonmarket benefits, as well as the added value of the inventory of forest resources in the future.

The change in economic benefits and cash flows over time are discussed further in the following pages.

About $164 million in discounted benefits are uninduced by management activities. These values would be produced merely by maintaining the Forest in public ownership and protecting the resource values, as described for the minimum level benchmark. (See Final EIS Appendix Volume, Appendix B, Part 6). Benefits produced under minimum level management would include dispersed recreation, wildlife RVDs, and fishing RVDs. Of the benefits displayed in Table 2.13, about $95 million of the recreation, $26 million of the wildlife, and $39 million of the fisheries benefits are uninduced. (See Final EIS Appendix Volume, Appendix B, Part 6, Table B6.64).

Refer to the Final EIS Appendix Volume, Appendix B, Part 8, Table B8.4 for a more detailed display of economic benefits and cost by categories.

Differences in Economic Benefits and Cash Flows

Economic benefits associated with market and nonmarket resources are described in detail in the Final EIS Appendix Volume, Appendix B, Part 4, Economic Efficiency Parameters. A detailed display of market and nonmarket benefits produced by decade by alternative can be found in the Appendix Volume, Appendix B, Part 8, Table B8.5. Market resources include timber, campgrounds, minerals, and special uses for which fees are collected. The displayed economic benefits for market resources include actual dollar receipts. Nonmarket resource values are dollar values assigned to dispersed, noncharge developed, fishing, and wildlife-based recreation uses. The purpose of assigning dollar values is to reflect a more complete economic value even though none or only part of that value associated with particular resources is actually collected as fees under current laws and policies. Economic benefits increase for all alternatives through time as both timber and recreation outputs increase along with the increases in demand for those goods and services.

Receipts other than those from timber sales are expected to be relatively minor (2 to 3 percent of total cash receipts).

The economic values displayed do not include those associated with possible future minerals production. Substantial mineral resources are known to exist on the Forest, but most of them are held by private corporations and individuals. In the case of minerals that are owned by the federal government, the timing of their development and the quantities that will be extracted are highly speculative. These economic values are not expected to differ significantly among alternatives.

Total cash receipts vary more by alternative than do noncash benefits to users, or total cash cost. This is in great part due to the relative amount of higher valued timber products produced. Alternatives 1 and 4 emphasize high-value hardwoods and deemphasize the production of aspen products. This combination increases total cash receipts while maintaining approximately the same level of total cash cost.

However, the noncash benefits, both priced and nonpriced, of providing a higher level of aspen product, and important habitat conditions for wildlife species that utilize aspen must also be considered. These benefits are provided in low amounts in alternatives 1 and 4.

Total cash receipts are projected to increase over time in all alternatives. This projected increase is due primarily to increased timber output in response to better local markets and the increased consumption of timber products from the Forest, as well as a general increase in the quality and value of timber produced from the Forest. Over time, the Forest will be capable of supplying a larger amount of high quality and high value northern hardwood sawtimber and veneer.

Total nonmarket priced benefits to users are also projected to increase. This is due primarily to increased demand and expected consumption of the various categories of recreation.

Consumption estimates were made for both timber and nontimber products. These estimates were used to limit the production of timber and the valuing of nontimber benefits. Most of the alternatives were at the upper limits of these consumption estimates because it was the most efficient level of production.

The level of expected timber consumption is equal to the Allowable Sale Quantity for the preferred alternative, which is 13.1 MMCF per year for the first decade. This was an efficient level of production and is a slight increase from the 12.6 MMCF programmed allowable harvest which was planned in the 1976 timber management plan for the Ottawa National Forest.

Comparisons of economic benefits to budget cost provide a measure of the economic efficiency of the alternatives. Cash receipts and cost measure actual cash flows to and from the U.S. Treasury and the taxpayers. On this Forest, net cash receipts are generally negative in the early decades, becoming positive in the later decades, as indicated on Table 2.14, and in greater detail in the Final EIS Appendix Volume, Appendix B, Part 8, Table B8.5. The improved economic efficiency over time is due primarily to three factors: increasing demand and output of market and nonmarket goods, decreasing unit cost, and reduced capital investment for roads.

The improved market and increased consumption of timber, along with the increased output and value of timber, result in significant increases in total receipts in later decades. Expansion or construction of additional wood processing facilities could also increase real prices for some wood products. Increased dispersed and developed recreation use, along with the increased output, also produces significant increases in the nonmarket priced benefits in later decades. Capital investment into local road construction will decline dramatically in later decades (fourth decade and beyond). Once an area of the Forest has been made accessible, re-entry at a later time will utilize the same transportation system with significantly reduced cost.

Cash flows associated with the timber sale program have been of particular concern when the sale of timber generates less revenue than the cost to prepare and administer them.

Below cost timber sales are a concern to both the public and National Forest managers.

The Ottawa National Forest Plan maximizes long-term net public benefits even though the timber program in the first decade generates less revenue than total costs. The timber program generates positive cash flows in the later decades, and thus the cash flow problem is short-term.

The timber management program is an important means of providing many benefits such as:

- Enhancing visual quality,
- Maintaining vegetative diversity for wildlife,
- Reducing the potential for insect and disease problems,
- Generating revenues to the U.S. Treasury
- Generating revenues to the local units of government,
- Financing investments in roads, reforestation and other sale area improvement projects,
- Improving the growth and quality of the timber resources and for generating local income and employment.

These nontimber objectives, particularly those associated with wildlife habitat improvement and insect and disease management are accomplished much more effectively and efficiently through the use of commercial timber sales than if they were accomplished by other means.

Since many of these activities would require the cutting and removal of trees, it would result in an additional expense to the government and unnecessary waste of a commercially valuable resource.

Some of the costs that are often counted against sale revenues are in fact capital costs. As such, they more properly should be viewed as long-term investments from which total benefits may not be realized for many years. Road costs are a good example of such a long-term investment.

Recent actions have been included in the Forest Plan to improve the economic efficiency of the Forest's timber program. The Forest Plan emphasizes the use of existing roads to reduce total road cost. The standards and cost for such activities as sale preparation, sale administration, road construction, landline location, and reforestation will continue to be evaluated and reduced to the extent practicable while still meeting all legal requirements and integrated resource management objectives. These measures will reduce the total average unit cost associated with the timber sale program.

Forest management involves a variety of long-term investments such as road construction, reforestation, timber stand improvement and, to some degree, commercial thinnings. Because of the long-term nature of Forest management investments, a longer planning horizon must be used for evaluating the economic efficiency of different investment alternatives. Investments into roads, reforestation, and timber stand improvements produce many benefits that are realized over an extended period of time. For example, a road constructed in conjunction with a timber sale provides for the benefits associated with that timber sale as well as benefits associated with future timber sales that utilize the same road system at a later date. This same road system may also help provide annual recreation benefits by providing access for motorized recreation activities (if the road remains open) or

nonmotorized recreation activities (if the road is closed intermittently).

This results in increasing positive cash flows in future decades as compared to present, due to increasing outputs and values in the future, combined with reductions in capital investment cost.

Using present net value over a long period of time indicates that all of the alternatives are economically efficient. However, some may provide a greater net economic benefit or respond in a more positive manner to the Forest's management problems.

Ranking of alternatives by PNV (Table 2.13) provides different results than if alternatives are ranked by net cash flow for the first decade (Table 2.14). This difference occurs because the PNV calculation includes all priced economic benefits, both cash and noncash, for not only the first decade but also for future decades. Therefore, the rankings by PNV provide more long-term comparison and greater consideration of the priced nonmarket benefits. Rankings by cash flow emphasize short-term cash flow.

Table 2.14
Average Annual Cash Flows and Noncash Benefits in the First and Fifth Decade by Alternative 1/

(alternatives ranked in order of decreasing net cash receipts)

Alternative	Decade 1				Decade 5			
	Net Cash Receipts	Total Cash Cost	Total Cash Receipts	Noncash Benefits to Users	Net Receipts	Total Cost	Total Receipts	Noncash Benefits to Users
	(million dollars in 1978 terms)							
1	-2.1	3.8	1.7	9.4	+0.2	4.8	5.0	13.7
4	-2.4	3.8	1.4	9.3	+0.3	4.6	4.9	13.4
8	-2.6	3.9	1.3	9.3	+0.2	4.5	4.7	13.5
3	-2.6	3.8	1.2	9.1	-0.1	4.9	4.8	13.5
6	-2.7	4.0	1.3	9.2	-0.3	4.8	4.5	13.1
2	-2.8	3.8	1.0	8.8	0	4.6	4.6	13.1
7	-2.9	4.2	1.3	9.2	+0.2	4.5	4.7	13.4
5	-3.1	3.5	0.4	8.8	-0.4	3.3	2.9	11.3

1/ Noncash benefits only include those standard products that could be assigned a dollar value. It does not include those benefits, often of substantial worth, for which no conclusive means is available to estimate their dollar value. See the discussion of nonpriced benefits in the Draft EIS Appendix Volume, Appendix B, part 4, page B4-19.

Major Tradeoffs Among Alternatives

This section summarizes the relationships among the economic values discussed in the previous section, the economic impacts on local communities, and the differing responses among alternatives to selected ICOs discussed in Appendix A of the Final EIS Appendix Volume. The purpose is to highlight major economic and noneconomic trade-offs or combinations of differences that can be quantified as indicators of response to management problems among alternatives. However, a complete understanding of differences among alternatives requires reading all of this chapter and Chapter IV of the Final EIS.

To provide a partial framework for assessing these tradeoffs, the long-term resource demands or needs of the nation, region, and local communities are briefly summarized. Finally, differences and similarities among individual alternatives are summarized in terms of major trade-offs among competing objectives or responses to expressed public issues, management concerns, or resource use and development opportunities.

National, Regional and Local Overview

National (RPA) planning estimates that total national demands will rise for all outputs of the National Forests. At the same time, there is a strong demand to protect and enhance the quality of the environment. Demands and prices for commodity production are generally determined in national markets and the nation benefits most when supplies are provided from the most efficient sources of production.

Because of its location and available natural resources, the Ottawa National Forest is a highly sought after source for a variety of timber products as well as recreational opportunities. The lake states region has traditionally been one of the primary areas of the country for the production and distribution of pulp and paper products. The western Upper Peninsula has also been an important and efficient source of hardwood sawtimber and veneer to both domestic and foreign markets. With the development of waferboard and other particle board products, the lake states region has also become a primary location for new mills of this type, because of the availability of aspen.

Demands for outdoor recreation uses are essentially all local and regional. Recreationists come predominantly from the area within or immediately adjacent to the Forest and from the major population centers of Wisconsin, Minnesota, Illinois, and the lower peninsula of Michigan. Total recreation use of the Forest is expected to increase 60 to 70 percent over the next 50 years.

The economic impacts of activities on the Ottawa National Forest are most significant in the counties of the western Upper Peninsula of Michigan and northern Wisconsin, which are within or adjacent to the Forest.

Population has declined in the western Upper Peninsula over the past 60 years due to the decline of the iron mining industry and the lack of jobs. The northern Wisconsin counties have had increased in population.

Since 1980, unemployment rates in the local area have risen significantly when compared to State averages because of several major and small industries which closed or reduced services in the early 1980's.

However, the future for econimic growth is beginning to look more optimistic. A major copper mine and processing mill which have been a major employer have reopened. A new major pulpmill has recently been constructed and begun production. A major plywood manufacturing plant will also reopen in the fall of 1986. A new waferboard mill will be constructed in the western Upper Peninsula. There has also been speculation that another new major pulpmill could be constructed in the western Upper Peninsula.

The tourism and recreation-related industries continue to grow, however, at a slower rate than in the 1970's. Some of these industries are expanding to provide year-round operations, especially those associated with the major downhill ski areas in the extreme western end of the Forest and surrounding area.

Economic Values and Responses to Major Issues, Concerns and Resource Use and Development Opportunities

The major reason that alternatives differ is that each responds to the Forest's issues, concerns, and resource use and development opportunities (ICOs) in different ways. (See Comparison Based on the Management Problems, in this chapter.)

This section summarizes many of these differences in responses in terms of indicators of those responses that can be quantified.

It also discusses indicators of central concern to the nation as a whole, as owners of this Forest. Appendix A in the Final EIS Appendix Volume discusses each of the ICOs and the linkages between the ICOs and the individual indicators, or key measures of response to the ICOs.

A complete discussion of the range of response to management problems among alternatives, in terms of individual indicators is provided in the previous section of this chapter, Comparison Based Upon the Management Problems. Table 2.15 provides a comparison of alternatives in terms of the economic values of national concern along with indicators of responsiveness to the

management problems, which include both local and national issues and concerns.

Alternatives in this table are ranked in order of decreasing PNV. Reductions in PNV from one alternative to another represent the opportunity cost of selecting an alternative with the lower PNV. However, this opportunity must be weighed against desired responses to the management problem in terms of the indicator of responsiveness.

Table 2.15
Indicators of Responsiveness of Alternatives to Major Issues and National Concerns

Indicators of Responsiveness to Major Issues and National Concerns	Alternatives (in order of decreasing PNV)							
	Alt. 1	Alt. 4	Alt. 7	Alt. 8	Alt. 6	Alt. 2	Alt. 3	Alt. 5
Economic Efficiency and Impact Concerns								
	(millions of 1978 dollars)							
PNV	275	267	248	247	244	244	242	201
	(million dollars)							
Average annual receipts (current level = 1.0)								
First decade	1.7	1.4	1.3	1.3	1.3	1.0	1.2	0.4
Fifth decade	5.0	4.9	4.7	4.7	4.5	4.6	4.8	2.9
Average annual budget (current level = 3.9)								
First decade	3.8	3.8	4.2	3.9	4.0	3.8	3.8	3.5
Fifth decade	4.8	4.6	4.5	4.5	4.8	4.6	4.9	3.3
Average annual net cash receipts (current level = -2.9)								
First decade	-2.1	-2.4	-2.9	-2.6	-2.7	-2.8	-2.6	-3.1
Fifth decade	+0.2	+0.3	+0.2	+0.2	-0.3	0	-0.1	-0.4
Average annual payments to counties	(thousand dollars)							
First decade	787	787	787	787	787	787	787	787
Fifth decade	1,238	1,230	1,180	1,180	1,121	1,155	1,206	787
Average annual nonmarket priced benefits								
First decade	9.4	9.4	9.2	9.3	9.2	8.8	9.1	8.8
Fifth decade	13.7	13.4	13.4	13.5	13.1	13.1	13.5	11.3
	(million dollars per year)							
Total Forest-dependent 1/ income	30	31	29	29	29	26	28	24
	(person-years per year)							
Total Forest-dependent 1/ employment	2,100	2,200	2,100	2,000	2,100	1,900	2,100	1,800
Vegetation and Wildlife Management Issues and Concerns								
	(thousand acres)							
Acres suitable for timber production	703	635	562	572	515	632	662	222
	(thousand acres)							
Acreage of aspen type maintained	97	66	138	129	76	116	186	0
Acreage of conifer thermal cover	160	158	150	152	164	137	140	141

Table 2.15 (continued)

Indicators of Responsiveness to Major Issues and National Concerns	Alternatives (in order of decreasing PNV)							
	Alt. 1	Alt. 4	Alt. 7	Alt. 8	Alt. 6	Alt. 2	Alt. 3	Alt. 5
	(thousand acres)							
Acreage of even-aged hardwood management	289	221	113	125	48	272	258	---
	(percent of type)							
	72	58	40	44	23	81	90	---
	(thousand acres)							
Acreage of uneven-aged hardwood management	114	160	165	160	162	62	30	202
	(percent of type)							
	28	42	60	56	77	19	10	100
Average annual timber harvest volume	(million cubic feet per year)							
Aspen products (first 2 decades) (current level = 3.2) (demand level = 5.2)	2.7	2.7	4.3	4.1	3.1	3.2	4.6	0.7
Hardwood sawtimber (first 2 decades) (current level = 1.5) (demand level = 2.3)	2.9	2.5	2.1	1.7	2.0	1.6	1.4	0.9
Total timber (first 2 decades) (current level = 10.3) (demand level = 16.1)	16.0	16.0	16.0	15.9	15.0	14.0	15.9	7.0
Aspen products (first 5 decades) (demand level = 7.4)	4.2	3.5	5.3	5.9	2.7	4.1	6.2	0.3
Hardwood sawtimber (first 5 decades) (demand level = 2.7)	4.1	4.0	3.9	3.5	3.8	3.6	3.0	3.4
Total timber (first 5 decades) (demand level = 21.9)	21.9	20.9	21.2	21.2	19.4	20.1	21.6	8.7
Average annual aspen regeneration by wildlife opportunity area (first 2 decades)	(average annual acres)							
High opportunity area (53%)	530	660	1,660	1,980	500	1,310	3,350	---
Medium opportunity area (25%)	90	0	962	860	320	0	1,470	---
Low opportunity area (22%)	220	0	630	390	390	320	530	---
Total	840	660	3,252	3,230	1,210	1,630	5,350	---
Average annual reforestation acreage (2 decades)								
Artificial reforestation (current level = 962)	100	100	525	500	600	600	---	---
Natural reforestation w/site prep. (current level = 2,797 acres)	2,500	1,600	3,800	3,200	1,700	1,800	4,700	---
Average annual conifer release acreage (2 decades) (current level = 1,308)	---	50	650	150	700	150	---	---

Table 2.15 (continued)

Indicators of Responsiveness to Major Issues and National Concerns	Alternatives (in order of decreasing PNV)							
	Alt. 1	Alt. 4	Alt. 7	Alt. 8	Alt. 6	Alt. 2	Alt. 3	Alt. 5
	(average annual acres)							
Average annual acreage of conversion to pine (2 decades)	---	---	325	200	500	550	---	---
Average annual temporary openings (2 decades)								
Clearcuts (current level = 4,817)	2,060	2,330	4,860	4,450	3,660	3,270	5,740	---
Other (seed/removal) (current level = 350)	3,150	2,800	1,865	650	1,770	1,150	30	---
Total (current level = 5,167)	5,210	5,130	6,725	5,100	5,430	4,420	5,770	---
Transportation/Roading Issues								
Distribution of ROS classes	(thousand acres)							
Roaded natural	639	472	711	670	592	820	721	555
Semiprimitive motorized	141	272	51	102	167	---	55	216
Semiprimitive nonmotorized	146	182	164	154	167	106	150	154
Average annual miles of road construction by standard (2 decades)	(miles per year)							
Total (current level = 41)	29	33	38	34	43	28	28	33
Winter-only	12	14	15	14	17	10	11	16
Winter/dry-summer	10	10	13	10	13	10	9	9
Summer-normal	7	9	10	10	13	8	8	8
Wilderness Issue								
	(thousand acres)							
Acreage recommended for wilderness study or designation	50.0	57.7	50.0	33.2	18.3	37.4	---	33.2

1/ Estimates are based on changes to the local economy as it existed in 1977.

Alternative 1

Alternative 1 exhibits the highest cost efficiency. This alternative has the highest output of hardwood sawtimber products as a result of a significant increase in even-aged harvest in the hardwood types. The high amount of recommended wilderness study also contributed to the higher PNV. This alternative, on the other hand, reduced the aspen type acreage and provided a relatively low amount of aspen timber products.

There is a relatively high amount of even-aged management in this alternative. This provides opportunities for increasing mid-tolerant species and age classes which results in a diverse range of wildlife species habitats. This condition will maintain viable populations of wildlife. Risk of wildlife species loss ranges from negligible to low-moderate. Refer to Final EIS Appendix Volume, Appendix F - Viable Populations of Vertebrate Species. The low amount of aspen will result in slightly lower deer/grouse habitat capacity than the present. An adequate amount of thermal cover is available. This alternative offers a wide variety of wildlife-based recreation for habitat for small and big game hunting and nonconsumptive uses of wildlife. There will be moderate habitat conditions for small and big game animals.

The increased emphasis on even-aged hardwood management will result in an increased acreage of regeneration cutting and the creation of temporary openings. However, the visual impacts can be mitigated through the distribution, size, shaping, and location of harvest cuts to meet visual quality objectives. Even-aged hardwood management will provide for an increase in visual variety such as size, color (fall color), and texture of vegetation.

Alternative 1 provides for over 50,000 acres of wilderness and wilderness study area. This along with moderate amounts of semiprimitive motorized, semiprimitive nonmotorized, and high amounts of roaded natural results in a mix of recreation opportunities.

Alternative 4

Alternative 4 has the second highest PNV, with an opportunity cost of approximately 8 million dollars. This alternative also carries the highest acreage of wilderness and relatively high amounts of hardwood sawtimber production. However, with the exception of alternative 5, this alternative would provide the lowest amount of aspen type and the lowest amount of aspen timber products. This alternative, therefore, could be considered to have a maximum response in providing the increased semiprimitive recreation opportunities and wilderness and be least responsive in providing improved habitat conditions for some species of

wildlife, such as deer and grouse. This alternative, however, does also provide the maximum amount of habitat for species of wildlife which require remoteness, such as the gray wolf.

There is a relatively moderate amount of hardwoods managed even-aged in this alternative as compared to the higher amount in Alternative 1. This provides important diversity with opportunities for increasing mid-tolerant tree species across the Forest. This alternative will also provide a wide range of age classes of vegetation. This condition results in a fairly diverse habitat which would provide a moderately wide range of wildlife species habitat. This habitat condition presents a negligible to low-moderate risk of loss to viable wildlife populations. The low amount of managed aspen acres will result in a much reduced deer/grouse habitat capacity than at present. The reduced road density across the Forest will limit hunter access compared to present conditions. Road closures called for in nearly 182,000 acres of semiprimitive nonmotorized condition will further constrain easy motor access.

There is a large amount of temporary opening from the emphasis of even-aged harvest cutting.

The increased emphasis on even-aged management will result in an increased acreage of regeneration cutting and creation of temporary openings. However, the visual impacts can be mitigated through the distribution, size, shaping, and location of harvest cuts to meet visual quality objectives. Even-aged hardwood management will provide for an increase in visual variety such as size, color (fall color), and texture.

Alternative 4 provides for about 57,710 acres of wilderness and wilderness study area, the most of any alternative. This alternative also has the highest amount (maximum) of semiprimitive motorized and semiprimitive nonmotorized conditions of all the alternatives.

Alternative 7

Alternative 7 has the third highest PNV, with an opportunity cost of approximately $27 million compared to alternative 1. This alternative carries a high amount of recommended wilderness designation and/or study and provides moderate to high amounts of hardwood sawtimber and aspen products. This alternative also provides a significant increase in the acreage of aspen type maintained and provides a more balanced mixture of even-aged and uneven-aged management hardwood while favoring the uneven-aged system. This alternative also distributes the acreage of aspen regeneration to areas of the Forest with the greatest opportunity to increase the quantity and quality of wildlife-based recreation uses, such as hunting.

The portion of hardwood type managed even-aged increases cover type and age class diversity with opportunities for increasing

mid-tolerant species. The components of uneven-aged hardwood management and old growth vegetation also add to the vegetative diversity. The mix of cover types and age classes provided results in a diverse habitat which would provide for a wide range of wildlife species habitats. This habitat condition will maintain viable populations of wildlife. Risk of loss of viable population range from negligible to low-moderate.

The moderate to high of aspen type maintained, an adequate amount of thermal cover, and the emphasis on aspen regeneration in areas of the Forest with the greatest opportunity to increase the quantity and quality of wildlife-based recreation results in a wide variety of wildlife-based recreation including moderate to good condition for small and big game hunting.

The combination of even-aged hardwood management and aspen management will result in an increased acreage of regeneration cutting and temporary openings. However, the visual impacts can be mitigated through the distribution, size, shaping, and location of harvest cuts to meet visual quality objectives. Even-aged hardwood management will provide for an increase in visual variety such as size, color (fall color), and texture.

Alternative 7 provides for about 50,000 acres of wilderness and wilderness study area. This along with moderate amounts of semiprimitive motorized and semiprimitive nonmotorized and high amounts of roaded natural results in a wide range of recreation opportunities.

Alternative 8

Alternative 8 has the fourth highest PNV, with an opportunity cost of approximately $28 million compared to alternative 1. This alternative provides relatively high amounts of semiprimitive recreation opportunities, with a moderate amount of recommended wilderness study. This alternative also produces moderate amounts of aspen products and maintains a moderate amount of aspen type. This alternative provides a somewhat balanced mix of even-aged and uneven-aged hardwood management with slight emphasis on uneven-aged management. With the exception of alternatives 3 and 5, this alternative provides the lowest amount of hardwood sawtimber.

There is a relatively moderate amount of hardwoods managed even-aged in the alternative which provides opportunities for increasing mid-tolerant species and providing a variety of age classes. This will result in a diverse habitat which should provide for a wide range of wildlife species habitat. This habitat will maintain viable populations of wildlife. Risk of loss ranges from negligible to low-moderate. This alternative offers a wide variety of wildlife-based recreation including moderate conditions for small and big game hunting and nonconsumptive uses of wildlife.

There would be a moderate to high amount of temporary opening from aspen clearcuts and the even-aged harvest cutting in the hardwood type.

However, the visual impacts can be mitigated through the distribution, size, shaping, and location of harvest cuts to meet visual quality objectives. Even-aged hardwood management will provide for an increase in visual variety such as size, color (fall color), and texture.

This alternative provides for about 33,176 acres of wilderness and wilderness study area. This, along with moderate amounts of semiprimitive motorized, semiprimitive nonmotorized, and high amounts of roaded natural, results in a wide range of recreation opportunities.

Alternative 6

Alternative 6 has the fifth highest PNV with an opportunity cost of approximately $31 million compared to alternative 1. This alternative provides moderate amounts of hardwood sawtimber while emphasizing uneven-aged management of the hardwood type. This alternative provides a relatively high amount of semiprimitive recreation opportunities but a relatively low amount of recommended wilderness study. Aspen products would be produced in moderate amounts in the early decades, with significant reductions in later decades along with the reduced acreage of aspen type maintained. This alternative maintains the second lowest amount of aspen type. This along with emphasis on uneven-aged management of the hardwood types would result in less favorable habitat conditions for wildlife species requiring young growth habitat, such as deer and grouse. This reduction in young growth habitat could reduce the amount and quality of hunting.

There is a low amount of even-aged management in the alternative which decreases diversity and opportunities for mid-tolerant species management. This alternative results in a lower diverse habitat than other alternatives and would result in a narrower range of wildlife species habitat. This habitat condition will have negligible or low-moderate risk of loss of viable wildlife populations. The relatively low amount of aspen will result in much lower deer/grouse habitat capacity than present. This alternative provides the highest amount of thermal cover as compared to all other alternatives. This alternative offers a wide variety of wildlife-based recreation with the same to slightly lower conditions for small and big game hunting. than alternative 1.

There is a large amount of temporary opening primarily from a mix of even-aged harvest cutting in the hardwood type, and even-aged harvest of conifer and aspen types.

This could have an impact on visual resources and recreation opportunities. There is a high amount of annual temporary

openings as a result of increased acreage of regeneration cutting compared to alternative 1. However, the visual impacts can be mitigated through the distribution, size, shaping, and location of harvest cuts to meet visual quality objectives.

Alternative 6 provides about 18,300 acres of wilderness study area. This along with moderate amounts of semiprimitive motorized, moderate amounts of semiprimitive nonmotorized, and high amounts of roaded natural results in a mix of recreation settings and a wide range of opportunities.

Alternative 2

Alternative 2 (current direction) has the sixth highest PNV with an opportunity cost of approximately $31 million compared to alternative 1. There is little variation in the mix of even-aged to uneven-aged management of hardwoods as compared to alternative 1. However, regeneration cutting in even-aged hardwoods would be low in the early decades. These factors coupled with lower wilderness recommended areas make significant contributions to a lower PNV.

In combinations with the reduction in thermal cover and reductions in temporary openings, the increase in managed aspen acres is estimated to slightly lower habitat for deer and grouse. Overall, there should be negligible or low moderate risk levels of loss of viable populations. Both consumptive and nonconsumptive wildlife-based recreation opportunities should be nearly equal to levels in alternative 1.

Roaded natural recreation opportunities are emphasized, with a relatively low amount of semiprimitive opportunities provided.

Alternative 3

Alternative 3 is the seventh highest in terms of PNV with an opportunity cost of approximately $33 million. This alternative provides the maximum benefit in terms of young growth habitat and game species of wildlife such as deer and grouse. This alternative would likely provide the greatest quantity and quality hunting. This alternative features the highest level of output of aspen products and maintains the largest acreage of aspen type, while emphasizing even-aged management of the hardwood type. Although this alternative requires the least amount of roads among the alternatives, it requires the highest amount of temporary openings, including clearcutting.

There is a high amount of even-aged management in this alternative which will increase diversity by increasing mid-tolerant species, aspen, and age classes that will provide a diverse habitat for a wide range of wildlife species. This habitat condition includes a high risk of maintaining wildlife

populations that nest in conifer types. The high amount of aspen and adequate amount of thermal cover will provide the highest deer/grouse habitat capacity of any alternative.

This alternative offers a variety of wildlife-based recreation activities while increasing habitat conditions for small and big game hunting in those areas of the Forest where the opportunity is greatest.

This alternative creates the highest amount of temporary openings of any alternative from the emphasis of even-aged harvest cutting in the aspen and hardwood types.

The emphasis on even-aged hardwood and aspen management will result in an increased acreage of regeneration cutting. However, the visual impacts can be mitigated through the distribution, size, shaping, and location of harvest cuts to meet visual quality objectives. Even-aged hardwood management will provide for an increase in visual variety such as size, color (fall color), and texture.

There are no areas recommended for wilderness designation or wilderness study in this alternative. However a modest amount of semiprimitive motorized and a moderate amount of semiprimitive nonmotorized along with high amounts of roaded natural areas results in a mix of recreation opportunities.

Alternative 5

Alternative 5 has the lowest PNV, with an opportunity cost of approximately $74 million. This alternative does not include any even-aged management (clearcutting) or use of chemicals for vegetative management purposes.

This alternative does not maintain any aspen type or even-aged hardwoods, resulting in a lack of young growth habitat conditions. Species of wildlife requiring young growth habitat, including deer and grouse, would decline under this alternative. The quantity and quality for hunting would be the lowest of all the alternatives, as would the level of timber that would be produced for all timber products.

With no even-aged management in this alternative, diversity decreases and opportunities for increasing mid-tolerant tree species decreases, resulting in relatively low habitat diversity which would provide for a narrower range of wildlife species habitat. Species nesting in regeneration, brushland, and young growth could have a high to very high risk of loss of viable populations. The lack of aspen will result in an unmanaged deer/grouse habitat. A lower amount of thermal cover than present would be available. This alternative offers a limited variety of wildlife-based recreation opportunities including a lower amount and quality of hunting.

The visual impact is minimal in this alternative because of lack of even-aged management and temporary openings.

Alternative 5 provides for about 33,176 acres of wilderness study area. This along with high amounts of semiprimitive motorized, moderate amounts of semiprimitive nonmotorized, and high amounts of roaded natural results in a mix of recreation opportunities.

Comparison to the RPA Targets

Although the Resources Planning Act (RPA) targets for the National Forest are not binding, a comparison must be made to Forest Plan alternatives. Of the eight alternatives, alternative 6 most closely compares to the 1980 RPA targets for the Forest through time.

Table B8.20 in the Final EIS Appendix Volume, Appendix B, Part 8 compares the 1980 targets to the levels of goods, services and activities scheduled in Alternative 6. The comparison is made in annual terms, for five decades extending to the year 2030. Differences between alternative 6 figures and RPA targets are often due to differences in perceived resource demand and/or the utility of certain activities with respect to the objectives of the specific alternative or the Forest in general.

Comparison of Environmental Consequences

Cumulative environmental effects of the alternatives may result from applying various combinations of management practices. The mix of prescriptions under each alternative produces different levels of resource outputs, goods, and services, including recreation benefits, wildlife habitats, and timber production.

Forestwide management area standards and guidelines, explained in Chapter IV of the Forest Plan, provide a minimum level of protection for all resources and measures to mitigate adverse environmental effects. These minimum levels of protection are incorporated into all management prescriptions. Therefore, none of the alternatives produce unacceptable environmental effects. However, the level of environmental protection above the base line level differs among the alternatives.

Possible cumulative environmental effects of the alternatives are summarized below. Detailed discussions of possible environmental effects can be found in Chapter IV of this document.

Soil Productivity

The cumulative effects on the soil productivity are primarily a result of the local road construction practice.

In the short term, alternatives 1, 2, 3, 4, 5, 7, and 8 have a lower impact than alternative 6. In the long term all alternatives have a much lower impact than the current level.

Minerals

The local road construction and wilderness designation management practices constitute the cumulative effects on the minerals environmental element. The impact of local road construction is similar to soil productivity, and is directly related to the amount of local road construction. Wilderness designation will prohibit the use of common variety minerals and surface disturbing exploration and extraction of federally owned minerals.

Alternatives 3 and 6 appear to represent a lower effect group for use of common variety minerals for local road construction and restriction of oil, gas, and hard rock exploration and extraction due to wilderness designation. Alternatives 1, 5, 7, and 8 represent a moderate effect group, and alternatives 2 and 4 represent a higher effect group.

Visual

The cumulative effects on visual resources result primarily from the obvious evidence of human-made corridors and temporary openings in the forest as the result of local road construction, harvest-clearcut, and harvest-shelterwood management practices.

Alternatives 2 and 3 have the greatest cumulative effect on the visual resources. As a result, the evidence of human disturbance in the Forest would be high under these alternatives. Under these alternatives, more than 70 percent of the Forest is assigned management area prescriptions that emphasize even-aged management, including harvest-clearcut and harvest-shelterwood management practices.

Alternative 5 would have the least cumulative effect on the visual resource. Evidence of human caused disturbance would be least evident under this alternative. Management area prescriptions that emphasize even-aged management are not assigned to management areas under this alternative. It would be easiest to meet visual quality objectives across the Forest, however, vegetation variety would be less in the future.

Alternatives 1, 4, 6, 7, and 8 have a low to moderate cumulative effects on the visual resource. Evidence of human caused disturbance would vary from low to moderate across the Forest. Under these alternatives, 26 to 56 percent of the Forest is assigned management area prescriptions that emphasize even-aged management. The remaining forest land is assigned management area prescriptions that emphasize uneven-aged, special, or protection management.

Visual quality objectives could be met under all alternatives. However, it would be easiest in alternatives 4, 5, 6, 7 and 8,

because a balance of management area prescriptions emphasizing both even-aged and uneven-aged management is provided.

Roadless Areas

There are four roadless areas on the Forest that were evaluated for recommendation for wilderness study or designation. The roadless areas are: Sylvania, Norwich Plains, Sturgeon Gorge, and the Cyrus H. McCormick Experimental Forest.

The cumulative effect of roadless areas is the amount and location of roadless areas recommended for wilderness study or designation under each alternative.

Areas recommended for wilderness study or wilderness designation are listed in Table 2.16.

Table 2.16
Roadless Area Acreage Selected for Wilderness Designation and Wilderness Study by Alternative

	Roadless Area				
Alternatives	Sturgeon Gorge	Sylvania	Norwich Plains	Cyrus H. McCormick Experimental Forest	Total
	(in net acres)				
1	14,849	18,327	0	16,850	50,026
2	14,849	18,327	4,212	0	37,388
3	0	0	0	0	0
4	14,849	18,327	7,684	16,850	57,710
5	14,849	18,327	0	0	33,176
6	0	18,327	0	0	18,327
7	14,849	18,327	0	16,850	50,026
8	14,849	18,327	0	0	33,176

Roads

The cumulative effects on the road system are the result of local road construction and wilderness designation management practices.

All alternatives except alternative 3 recommend wilderness study or designation for one or more roadless areas on the Forest. Refer to Table 2.16 above. Under these alternatives existing roads currently open for public and administrative use will be closed to motor vehicle use and converted to hiking trails where appropriate. Currently, some motor vehicle use for administrative use is permitted in the Sylvania, Cyrus H. McCormick Experimental Forest, and Norwich Plains roadless areas. Also, some roads in Sturgeon Gorge are open for public off-road vehicle use. Under wilderness management, motor vehicles can only be used under emergency situations or other

special situations regarding the protection of adjacent lands such as preventing the spread of wildfire.

Alternatives 1, 2, and 3 have the lowest average annual miles of local road construction in the first two decades. This is the result of concentrating management activities where fewer roads are needed and winter logging is emphasized, and because of the high amount of the Forest being managed for semiprimitive motorized and nonmotorized recreation opportunities. These areas have less new local roads constructed in them.

Alternative 6 has the highest amount of local road construction. This is the result of emphasizing uneven-aged management to produce quality northern hardwood sawlogs. This kind of vegetation management requires a higher density of permanent roads. However, more than 20 percent of the Forest is managed to provide semiprimitive motorized and nonmotorized recreation opportunities. Local roads in semiprimitive motorized areas would be closed to passenger vehicles. However they would be available for use by ATV-type vehicles including snowmobiles.

Alternatives 4, 5, 7, and 8 have a moderate average annual amount of local road construction.

Vegetation

The long-term vegetative conditions that result on forest land suitable for timber production are in great part due to the cumulative effects of vegetation management practices including: clearcut harvest, thinning harvest, selection harvest, shelterwood harvest, artificial reforestation, natural reforestation, and release.

In addition, roads have a significant effect in terms of providing the access needed to manage the vegetation.

Wilderness designation will have a significant effect on vegetation. Within roadless areas recommended for wilderness study or designation, cover type, and age class diversity will decrease with time and will establish and maintain a forest of mature and overmature trees of large size. However, from a Forestwide perspective this old forest condition would increase the range of vegetative conditions. Roadless areas recommended for wilderness study or designation are listed by alternative on Table 2.16.

The change in vegetative composition is most predictable for forest land suitable for timber production, where vegetative management practices are scheduled.

Table 2.17 summarizes the acreage of forest land suitable for timber production by alternative and vegetative type.

Table 2.17
Acres of Forestland Suitable for Timber Production by Vegetative Type.

Vegetative Type	Alternative 1	2	3	4	5	6	7	8
	(thousand of acres)							
Even-aged mangement hardwoods	289	272	258	221		48	113	125
Uneven-aged management hardwoods	114	62	30	160	222	162	165	160
Aspen and paper birch	97	116	186	66		76	138	129
Spruce-red and white pine	63	71	65	61		98	62	54
Balsam fir and jack pine	82	57	64	78		76	55	67
Hemlock	23	17	22	13		18	14	15
Swamp conifer	35	37	37	36		37	15	22
Total	703	632	662	635	222	515	562	572

The mix of even-aged and uneven-aged hardwood management and the acreage of aspen type maintained are the major types on the Forest and show the greatest variation by alternative.

Alternative 1, for example, places high emphasis on even-aged management of hardwoods and low emphasis on management of the aspen and paper birch type, but has a very low amount of uneven-aged hardwood management.

Alternatives 7 and 8 provide a somewhat equal mix of even-aged and uneven-aged management of hardwoods while maintaining moderate to high amounts of aspen and paper birch when compared to other alternatives.

Alternatives 5 which has no even-aged management in any forest type results in many acres unsuitable for timber production and creates more overmature conditions and could result in an increased risk of insect and disease outbreak when compared to other alternatives.

Timber Production

The level of timber production and the mix of species and products provided by an alternative are the result of the schedule of vegetative management practices.

Harvest practices such as clearcut, thinning, selection, and shelterwood all contribute to the production of timber products.

Table 2.17 summarizes the acreage of forest land suitable for timber production by alternative and vegetative type as shown above.

Some alternatives, such as alternative 1 place a relatively high emphasis on even-aged management of hardwoods and low emphasis on management of the aspen type for timber production. Alternative 3 places emphasis on management of the aspen type for timber production. Alternatives 7 and 8 place a moderate emphasis on uneven-aged and even-aged management of hardwoods, along with moderate amount of aspen type management for timber production.

Table 2.18 displays the volume of timber that would be produced (supplied) by alternative. The table shows the level supplied by species and product group. The table also shows the current level (1980-1984) of timber sold, and the anticipated level demanded by decade for each species/product group.

In some species/product groups and particularly in the total timber volume, the level of output by alternative is nearly the same. This is due to a limit on expected consumption (demand). In other words, several or all of the alternatives may satisfy demand for a particular product or total timber. For example, demand for total timber is satisfied in the first two decades in alternatives 1, 4 and 7.

Wildlife

Cumulative effects on wildlife are derived from local road construction, some vegetative management practices, and wilderness designation.

Alternatives 2, 3, 4, and 7 provide long-term productivity increases in habitats of wildlife species associated with openings and young growth and with increases in management of aspen and even-aged management of hardwoods. These species are represented by white-tailed deer and ruffed grouse.

Alternatives 1, 4, 5, 6, 7, and 8 provide long-term productivity increases of habitats of wildlife species associated with mature forests, as these forests continue to develop from the present dominant poletimber condition. These species are represented by northern goshawk, barred owl, and blackburnian warbler.

Alternatives 1, 3, 4, 5, 6, 7, and 8 provide long-term productivity increases of wildlife species associated with remote forests, as local road construction is reduced and/or roads are closed in some areas. These species are represented by black bear.

Endangered, Threatened, and Sensitive Species

Management direction does not vary by alternative in management of gray wolf, bald eagle and peregrine falcon habitat, and would not vary for any species which may be included on the R-9 sensitive species list.

Table 2.18
Timber Volume Scheduled for Removal

Species/product group	Amount Demanded 2/	Alternative 1	2	3	4	5	6	7	8
				(million cubic feet annually)					
Hardwood sawtimber (current level 1.5)									
Decade 1	2.1	2.1	0.8	1.1	1.4	0.5	1.7	1.8	1.2
2	2.5	3.6	2.5	1.7	3.6	1.4	2.3	2.4	2.9
3	2.5	3.9	3.9	1.8	3.9	3.9	3.9	4.1	3.2
4	3.0	5.0	5.0	4.4	5.0	5.0	5.0	5.0	5.0
5	3.3	6.0	6.0	6.0	6.0	6.0	6.0	6.2	6.0
Hardwood pulpwood (current level 2.0)									
Decade 1	3.3	3.8	3.8	3.8	3.8	3.8	3.8	4.3	3.8
2	5.6	6.5	4.8	6.5	7.2	5.6	7.8	7.4	6.8
3	6.8	5.4	6.0	10.0	5.2	2.9	4.4	6.5	9.0
4	8.0	7.7	9.9	8.4	6.1	4.0	4.8	7.0	7.0
5	8.9	3.2	3.6	4.2	2.8	2.7	5.0	2.8	2.4
Aspen sawtimber and pulpwood (current level 3.3)									
Decade 1	4.1	3.0	3.1	3.6	3.7	0.5	1.9	4.1	3.6
2	6.3	2.5	3.2	5.6	1.7	1.0	4.2	4.6	4.5
3	7.6	4.3	3.4	6.4	2.6	0.2	3.2	5.4	7.0
4	8.9	2.0	2.5	6.7	1.6	-	0.3	5.9	6.7
5	10.2	9.0	8.2	8.5	7.9	-	3.7	6.5	8.5
Softwood sawtimber (current level 0.9)									
Decade 1	0.7	2.2	1.3	2.1	2.2	0.1	2.2	1.6	2.1
2	0.7	3.6	3.7	3.0	3.6	0.5	2.4	2.6	3.2
3	0.8	5.8	5.3	2.7	5.3	1.4	5.9	4.5	2.9
4	0.9	8.2	4.5	4.7	8.8	2.5	8.0	5.9	5.8
5	1.0	8.5	7.4	7.8	8.6	0.6	8.8	8.1	7.6
Softwood pulpwood (current level 2.6)									
Decade 1	2.9	2.0	2.1	2.1	2.0	0.2	1.4	1.4	2.1
2	3.9	2.9	2.5	2.1	2.8	0.4	2.2	2.0	2.3
3	4.6	2.8	3.3	1.4	3.4	0.2	2.7	1.8	1.2
4	5.3	2.8	2.3	1.8	2.3	0.2	3.0	2.1	1.5
5	5.8	2.4	1.6	1.4	2.7	-	1.9	2.3	1.5
Total timber (current level 10.3)									
Decade 1	13.1	13.1	11.2	12.7	13.1	5.2	11.0	13.1	12.8
2	19.0	19.0	16.8	19.0	19.0	8.7	19.0	19.0	19.0
3	22.3	22.3	21.9	22.3	20.4	8.7	20.2	22.3	22.3
4	26.0	25.7	24.0	26.0	23.8	8.7	21.2	25.8	26.0
5	29.2	29.2	26.9	27.9	28.0	8.7	25.5	25.8	26.0
Long-term sustained yield capacity		31.0	29.0	28.0	29.8	9.7	25.5	26.7	26.0

1/ A simplified conversion to million board feet can be made by multiplying each number by 5.4.

2/ In some cases, there is a level of supply slightly in excess of demand for an individual species/product. This is due to the production of a product at a level which helps satisfy demand for another product for which it is substitutable. These figures represent initial estimates of demand which timber consumers have for timber products from the Forest. They have not been adjusted to reflect uncertainty nor do they reflect the possibility that other timber products may be acceptable substitutes in many cases. Refer to Final EIS Appendix Volume, pages B6-20 to 23 and B7-19 to 21 for additional

Recreation

The cumulative effect on recreation settings results from local road construction and wilderness designation management practices and is measured in terms of the mix of Recreation Opportunity Spectrum Classes (ROS) and the amount and location of areas recommended for wilderness designation or study, that will be provided under each alternative. Refer to Forest Plan Appendix F-Recreation Opportunity Spectrum Explanation for more information and definitions of the ROS system.

Each management area prescription represents a ROS class. As a result the amount of each ROS class in any alternative is directly linked to the acreage assigned to management area prescriptions.

The amount of Forest area assigned to ROS classes by alternatives is shown in Table 2.19.

Table 2.19
ROS Classes by Alternatives

ROS Class	Alternatives								
	Current	1	2	3	4	5	6	7	8
				(thousand acres)					
Roaded natural	820	639	820	721	472	556	592	711	670
Semiprimitive motorized	-	141	-	55	272	216	167	51	102
Semiprimitive nonmotorized	106	146	106	150	182	154	167	164	154
(Acres of above SPNM recommended for wilderness study) or designation	(0)	(50)	(37)	(0)	(58)	(33)	(18)	(50)	(33)

Economic

The cumulative effect on the economic environment of the Forest impact area is measured in terms of change in employment, income, and payments to counties. These effects result, directly or indirectly, from the expenditures to create the benefits ranging from market products such as timber, to nonmarket recreation including hunting opportunities. The cash revenues generated and the budget requirements are also discussed.

The net effect on employment in the first decade by alternative is displayed in Table 2.20.

Table 2.20
Estimate of Forest-dependent Employment in the First Decade

	Alternative							
	1	2	3	4	5	6	7	8
	(jobs/year)							
Forest-dependent employment	2,100	1,900	2,000	2,200	1,800	2,100	2,100	2,000

Employment associated with Forest goods and services is estimated at 1,900 for the current management or "no action" alternative. Other alternatives range from a loss of 100 jobs (alt. 5) to a gain of 300 jobs (alt. 4). The Ottawa National Forest is associated with slightly less than 10 percent of the total jobs in its impact area. Total regional employment during the 1977 base year was 22,900 person years per year.

The net effect on total regional income in the first decade by alternative is displayed in Table 2.21.

Table 2.21
Estimate of Annual Forest-dependent Income in the First Decade

	Alternative							
	1	2	3	4	5	6	7	8
	(millions of 1978 dollars)							
Forest-dependent income	30	26	28	31	24	29	29	29

All alternatives would, according to the estimates above, account for at least 10 percent of regional income over the first 10 years. A group of alternatives comprising 1, 3, 4, 6, 7, and 8 would all exceed 10 percent. Total regional income during the 1977 base year was $239 million.

Payments to local counties are estimated to be the same across all alternatives and would approximate the average of payments made over the last five years.

Returns to treasury includes all Forest cash receipts. The majority of these come from timber sale revenues. Other receipts come from campground receipts, minerals and special use permits.

Table 2.22 shows the estimated returns to the Federal treasury by alternative in the first and fifth decade.

Table 2.22
Average Annual Forest Receipts for the First and Fifth Decade

	Average Annual Receipts (1980-84)	Alternative							
		1	2	3	4	5	6	7	8
		(thousands of 1978 dollars)							
First decade	981	1,688	1,047	1,203	1,421	417	1,313	1,295	1,257
Fifth decade		4,951	4,621	4,826	4,923	2,856	4,486	4,723	4,723

All alternatives, with the exception of alternative 5, produce a gain in dollars returned to the national treasury when compared with the average over the years 1980 to 1984.

Alternatives 1, 6, and 7 produce significant increases in receipts when compared to the average. A second group made up of alternatives 2, 3, 4 and 8 produce positive but less significant increases.

All the alternatives show roughly a four-fold increase in returns to treasury between the first and fifth decades. This is due primarily to the increased output and value of timber, along with increased demand for timber products. This increased revenue over time far outstrips the expected increases in budget, which is discussed in the following section.

The estimated budget expense in the first and fifth decades, of each plan alternative is displayed in Table 2.23. Cost categories showing no significant change by alternatives, were grouped in the "other" category.

Table 2.23
Budget Level by Cost Category for the First and Fifth Decades

	Average Annual Budget (1980-84)	1	2	3	4	5	6	7	8
					(thousands of 1978 dollars)				
Cost Category									
Recreation									
First decade	449	342	402	425	356	432	342	437	432
Fifth decade		325	376	343	338	404	324	419	404
Vegetation management									
First decade	1,222	1,163	1,027	1,087	1,086	651	1,198	1,187	1,117
Fifth decade		2,278	1,993	2,406	2,062	861	2,210	1,943	1,986
Local road construction									
First decade	355	277	311	255	264	342	394	366	289
Fifth decade		230	272	198	208	101	183	162	188
Road Mtce., Collector Rds, Bridges, Dams & Facilities									
First decade	788	585	585	585	585	585	585	709	585
Fifth decade		528	528	528	528	528	528	528	528
Other									
First decade	1,084	1,478	1,478	1,478	1,478	1,478	1,478	1,478	1,478
Fifth decade		1,398	1,398	1,398	1,398	1,398	1,398	1,398	1,398
Total budget									
First decade	3,888	3,845	3,818	3,830	3,769	3,488	3,997	4,177	3,901
Fifth decade		4,774	4,567	4,873	4,562	3,292	4,643	4,450	4,504

In terms of total Forest budget level, only alternative 5 is estimated to have a significant difference from the average annual budget of the last 5 years. Other alternatives are within a range of $120,000 less to $110,000 more per year.

Almost all alternatives are estimated to have lower budget levels coupled with higher total cash receipts on the average over the

next decade than the average annual budget and revenue amounts of 1980-84.

Although the total Forest budget would increase over time in all of the alternatives, the increase in revenues far outstrip these increased costs. In addition, the level of nonmarket benefits are also expected to increase significantly over time, along with the increase demand for those benefits.

Social

A number of factors about the Forest and its managment were identified as being of particular importance to various groups of Forest users. In this discussion, the alternatives are reviewed in light of these factors. No attempt is made to determine what alternative is best for individuals or groups. Instead elements of the Forest thought to have an effect on these groups were identified. Sets of alternatives were defined as having more or less of those elements.

More detailed information about the effects of all alternatives on the social environment can be found in Chapter IV, Part D of this document.

Comparison of Other Environmental Effects

Comparison of other environmental effects including:
- Relationship between short-term use and long-term productivity,
- Irreversible or irretrievable commitment of resources,
- Unavoidable adverse effects,
- Mitigation common to all alternatives,

are summarized in Chapter IV, Parts E, F, G, and H respectively in this document.

Means to Mitigate Adverse Effects

Measures to avoid or minimize adverse environmental effects are included in the managment prescriptions. These prescriptions are included in Chapter IV of the Forest Plan. The prescriptions are an integral part of each alternative. That is, the practices must be applied to specific areas according to the prescriptions. A detailed discussion of the mitigation provided, including some additional measures can be found in Chapter IV of this document.

The following paragraphs summarize the mitigation measures implemented for protecting environmental conditions.

Riparian Areas - Riparian area standards and guidelines minimize management activities here to protect the wetlands, lakes, streams, and other riparian area resources.
Visual Quality - Standards and guidelines for each management area are designed to minimize the adverse affects of management practices, particularly of road construction and timber harvesting on the visual quality of the area.

Soil Productivity and Soil Loss - Standards and guidelines by landtype associations for major earth-disturbing activities, such as road construction and timber harvesting, provide direction to

ensure maintenance of soil productivity and minimization of soil losses.

Cultural Resources - Cultural resource surveys will be conducted in areas where earth-disturbing activities will occur and sites will be identified where modification of the proposed activity is needed in order to protect cultural resources. Procedures and requirements are contained in standards and guidelines applicable to all management areas.

Viable Populations of Native Vertebrates and Plants - Wildlife management standards for each management area will ensure that viable populations of native species are maintained Forestwide. Special direction addresses mitigating measures for endangered, threatened, and sensitive species.

Habitat Diversity - Standards and guidelines for timber and wildlife for each management area and the mix of management areas selected in each Forest Plan alternative help ensure the Forest will continue to maintain adequate wildlife habitat diversity.

Recreation Opportunities - Standards and guidelines for each management area and the mix of management areas selected in each alternative help ensure that management activities, such as road construction and timber harvesting, will not interfere with the Forest's ability to provide the appropriate mix of recreation opportunities.

Monitoring Requirements

To determine if planned actions produce the desired results, monitoring and evaluation requirements are established in Chapter V of the Forest Plan. Some of the management practices will be observed and their effects recorded in order to ensure that the goals and objectives of the Forest Plan are being met. The monitoring results will be evaluated in order to determine whether changes are needed in the Forest Plan to make it more effective or to respond to changed or unexpected conditions.